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The genus *Oncophorus* (Musci: Dicranaceae) in Maine

Bruce Allen

Oncophorus is a genus of six species (Frahm *et al.* 1998) found in both the northern and southern hemispheres. The genus has a haplolepideous peristome with a distinctively ornamented outer (dorsal) surface, i.e., thickly papillose with the papillae coalesced into vertical rows (see Frahm *et al.*, figs 8 & 9, 1998). This type of peristomal ornamentation is identical to that found in most species of *Dicranum* and in *Fissidens* section *Serridium* (Allen 1980). Other distinctive features of *Oncophorus* include its strongly dimorphic upper and lower leaf cells, weakly developed to absent alar cells, dimorphic exothecial cells, and asymmetrical, furrowed capsules with a well-developed struma on the neck.

Frahm *et al.* (1998) considered the generic relationships of *Oncophorus* difficult to ascertain. They suggested possible relationships to *Cynodontium* (Cynodontioideae), the *Anisothecium* group of *Dicranella* (Dicranelloideae), as well as a placement within the Dicranoideae. Both *Cynodontium* and *Dicranella* have species with strumose, asymmetrical capsules, and scarcely developed alar cells. *Dicranella* also has species with sheathing leaf bases as well as species with a somewhat similar peristome ornamention as that of *Oncophorus*. Neither genus, however, has strongly dimorphic upper and lower leaf cells, and *Cynodontium* has papillose leaf cells.

Grout (1937) seems to be the first to have called attention to the gametophytic similarities between *Oncophorphus* and *Symblepharis*: "Bartram's plants [*Symblepharis vaginata*] grew on a log and if sterile could with difficulty be told from *Oncophorus wahlenbergii*, ..." The only apparent gametophytic difference between the two species is the presence of bistratose leaf margins in *O. wahlenbergii*. Sometimes, however, the leaves of *S. vaginata* are lightly bistratose at the margins. *Symblepharis* differs sporophytically from *Oncophorus* in its plurisetous condition, erect capsules with homogeneously long-rectangular exothecial cells, and narrower peristome teeth that are either ornamented with vertical bars or evenly papillose on the outer (dorsal) surface. *Oncophorus* is predominantly a northern hemispheric genus with two south temperate outliers: *O. luteo-virens* Bartr. *in* Roiv. and *O. fuegianus* Card. The sporophytes of neither of these south temperate species are known. *Symblepharis,* on the other hand, is predominantly a southern hemispheric genus, and due to the close gametophytic similarity between the two genera it would seem that *O. luteo-virens* and *O. fuegianus* are better placed in *Symblepharis*.

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Nevertheless, it may be that within the Dicranoideae *Oncophorus* is closer to *Dicranum* than to the *Symblepharis/Holomitrium/Eucamptodontopsis/Schliephackea* group. In addition to their very similar peristomes, *Dicranum* is predominantly a northern hemispheric genus with some species having strongly dimorphic upper and lower leaf cells. *Dicranum* differs from *Oncophorus* in having non-sheathing leaves with well-developed alar cells, and non-strumose capsules with homogeneous exothecial cells.

The name *Oncophorus* combines the Greek "*onkosis* - a swelling", and "*phoros* - bearing or carrying", a reference to the struma on its capsule neck.

Oncophorus (Brid.) Brid., Bryol. Univ. 1: 389. 1826.
Dicranum sect. *Oncophorus* Brid., Muscol. Recent. Suppl. 53. 1819.

Plants green to yellow-green in tufts. Stems erect, in cross-section with central strand well-developed; tomentose at base, rhizoidal initials scattered on stem or associated with branch buds. Leaves usually crisped, from an oblong to obovate variously clasping base abruptly narrowed to a long-linear to long-lanceolate limb; acuminate; margins erect or recurved at midleaf, serrulate to dentate; costa subpercurrent to excurrent, in cross-section with ventral and dorsal surface cells enlarged, median guide cells and two stereid bands; upper cells quadrate to oblate, smooth, usually bistratose at margins; basal cells rectangular to elongate; alar cells not or weakly differentiated. Autoicous, perigonia in axillary buds, perichaetial leaves weakly differentiated. Setae single, erect, elongate. Capsules inclined to horizontal, strongly curved and asymmetric, furrowed when dry; stomata sparse in capsule neck; strongly strumose; annulus rudimentary; peristome teeth haplolepideous. Spores smooth or lightly roughened. Calyptrae cucullate. n = 14 (Fritsch 1991).

Oncophorus wahlenbergii Brid., Bryol. Univ. 1: 400. 1826.

Plants in compact or loose, green to yellowish-green tufts. Stems 10–25 mm tall, rhizoids dimorphic: large, reddish, sparsely branched ones originating from the rhizoidal initials and slender, reddish to white, densely branched ones originating from the large, red rhizoids; stems in cross-section with 1–2 rows of small, more or less firm-walled epidermal cells, central strand well-developed. Leaves 4–6 mm long, strongly crisped and curled when dry, obovate or oblong and clasping at base, decurrent, abruptly narrowed to a long-linear or long-lanceolate, flexuose, subtubulose limb; margins erect, bluntly serrulate to dentate above, bistratose; costae percurrent to shortly excurrent, roughened to toothed at back, in

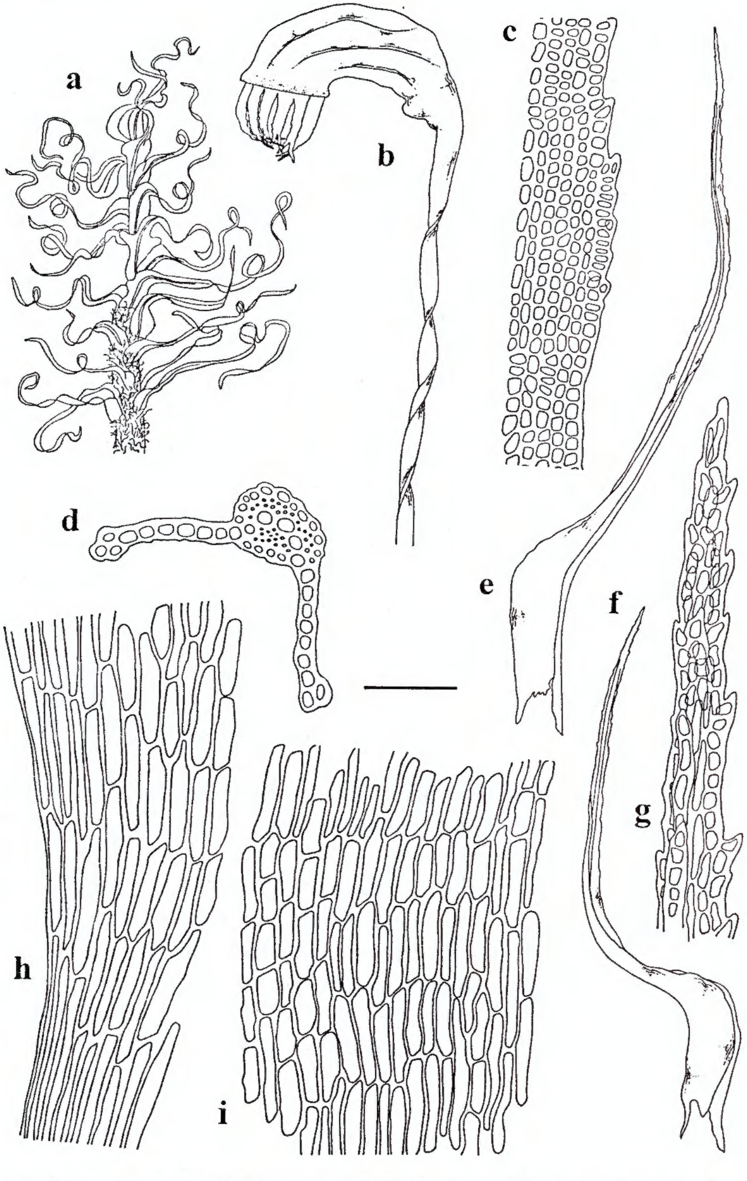

Figure 1. *Oncophorus wahlenbergii* a. Habit. b. Sporophyte. c. Upper leaf margin. d. Cross-section from upper half of leaf. e. & f. Leaves. g. Leaf apex. h. Leaf base in alar region. i. Basal leaf sheath cells. Scale bar in mm: bar = 0.05 (d); bar = 0.07 (c,g,h,i); bar = 0.71 (e,f); bar = 0.5 (b); bar = 1.7 (a). All figures from *Allen 21565* (MO).

cross section with enlarged ventral and dorsal surface cells, single row of guide cells, ventral and dorsal stereid bands well-developed; upper cells quadrate to oblate, 6 x 6–8 µm, thick-walled; basal cells hyaline, firm- to thin-walled, rectangular to elongate, 24–80 µm x 4–8 µm; alar cells not differentiated. Setae 10–27 mm long, yellow, becoming reddish with age, twisted above when dry. Capsules reddish-orange, 1–2 mm long; exothecial cells rounded to quadrate on lower side, long-rectangular on upper side; annulus rudimentary, consisting of two rows of quadrate, thin-walled cells adhering to the capsule mouth and operculum base after dehiscence; stomata sparse, phaneroporic, in capsule neck; opercula short-rostrate, 1 mm long; peristome teeth 16, divided in upper 1/3, dark-red, outer (dorsal) trabeculae weakly thickened, inner (ventral) trabeculae heavily thickened, outer (dorsal) lamellae densely papillose, the papillae in vertical rows, inner (ventral) lamellae sparsely and irregularly roughened. Spores 16–24 µm, lightly roughened. Calyptrae smooth, entire at base, 3 mm long.

On rotting wood (*Acer*, *Betula*) in forests or *Thuja* bogs, on soil and humus, at times on boulders or soil in cracks of asphalt roads. In Maine known from Aroostook (*Allen 21565* MO), Cumberland (*Norton 2863* MAINE), Franklin (*Allen 10281A* MO), Hancock (*Allen 2122* MO), Kennebec (*Allen 10169* MO), Knox (*Allen & Allen 6057* MO), Lincoln (*Allen 6022* MO), Oxford (*Lowe* MAINE), Penobscot (*Allen 16540* MO), Piscataquis (*Hermann 19263* US), Sagadahoc (*Norton* MAINE), Somerset (*Allen 9333* MO), and Washington (*Pedano 594* MO) Counties.

Oncophorus wahlenbergii is usually found on rotting wood in wet or moist localities. Plants from this type of habitat are fairly robust and have crispate leaves with long, whitish, strongly sheathing leaf bases that help in recognizing the species in the field. In dry, exposed situations (e.g., *Allen 6022* MO), the plants are small and compact with broader leaves having short, weakly sheathing leaf bases. This expression of the species can be difficult to separate from *O. virens* (Hedw.) Brid. which has erect leaf bases and ovate-lanceolate leaves. *Oncophorus virens* differs from all expressions of *O. wahlenbergii* in having leaf margins recurved in the region of the sheath/limb junction and alar cells that are somewhat enlarged and weakly differentiated.

The sporophytes of *O. wahlenbergii* are very distinctive. The capsules are strongly inclined, asymmetric, furrowed, and have a well-developed stroma. The strong bending of the capsule in this species results from the presence of dimorphic exothecial cells: the upper (i.e. outside curve) cells are long-rectangular while the lower (i.e., inside curve) cells are rounded to quadrate. *Oncophorous wahlenbergii* is autoicous with gemmate perigonia found a little below the perichaetia. The perigonia, however, are difficult to see without dissecting the plants because of the long, strongly sheathing, vegetative leaf bases.

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Lunularia cruciata (Lunulariaceae) growing outdoors in New York

Norman Trigoboff

In November, 1999, I found *Lunularia cruciata* (L.) Dum. covering ca. 2.5 square meters, in a somewhat sheltered site, in Ithaca, New York, USA. Although common through much of the world and known in greenhouses on the Cornell University campus since 1890 (*E. J. Durand 358*, CU), this may be the first time *L. cruciata* has been reported persisting outdoors in northeastern North America.

The gemma receptacles were abundant and closely placed one behind the other, 0.5 to 3 mm apart, up to six in a line, like a ladder with curved rungs. This differs from the drawing in Schuster (1992) and from herbarium specimens at BH-CU and in my own collection. This growth form may be a response to cold -- perhaps combined with shade.

The following details indicate the degree of protection of the site:
Growing abundantly on a few cm. deep, bare, moist soil overlying bricks, in a 1.25 m. by 2.5 m., 1.7 m. deep, concrete-walled ventilation well abutting a basement window, within an unroofed, three-walled court on the north side of Sage Chapel, protected from footsteps, not receiving direct sunlight, yet fully open to rain and snow, having little leaf accumulation (raked in late December 1999) and slight thermal shielding -- the soil here freezing less readily and thawing faster than the surrounding soil in winter. Progressively less well developed plants grew to ca. 30 cm. up the concrete wall.

Specimens have been deposited at BH (*Trigoboff c994*) and *NYS (Trigoboff c993*).

Acknowledgements: I am grateful for access to BH-CU specimens and literature and to Robert Dirig for reading a draft of this article.

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Campylium radicale (Musci: Amblystegiaceae) New to Missouri and Interior Highlands of North America

Carl Darigo

Campylium is a genus of pleurocarpous mosses predominately found on soil, humus, logs or rocks, generally in moist, forest habitat. Four *Campylium* species (*C. chrysophyllum* (Brid.) J. Lange, *C. hispidulum* (Brid.) Mitt., *C. polygamum* (Schimp. in B.S.G.) C. Jens., *C. stellatum* (Hedw.) C. Jens. var. *stellatum*) have previously been recorded (Redfearn 1983, 1999) in the Interior Highlands of North America, comprising the southern half of Missouri below the Missouri River plus parts of eastern Oklahoma, northern Arkansas and southern Illinois. This paper reports *Campylium radicale* (P. Beauv.) Grout new to Missouri and the Interior Highlands of North America.

Campylium radicale was collected 29 August 1999 by Bill Summers, recently retired from the Missouri Botanical Garden's Flora of Missouri Project, with Stan Hudson, in a remote section of northeast Carter County, located in southeast Missouri on the Salem Plateau of the Interior Highlands. The collection was made in Mark Twain National Forest, Twin Ponds, ca. 7 air miles north of Ellsinore MO, along south shore of the east sinkhole pond, elevation 760 ft, *Summers & Hudson 9431* (MO). The moss, which had gametongia but no sporophytes, was growing in scattered patches on shaded, muddy soil along water's edge of a natural, collapsed, buttonbush (*Cephalanthus occidentalis* L.)-bordered sinkhole pond in an upland oak-hickory forest, mixed with *Climacium americanum* Brid. and *Leptodictyum riparium* (Hedw.) Warnst.

Literature reports (Crum & Anderson 1981, Ireland 1981, Reese 1984) indicate *Campylium radicale* occurs in eastern North America, Newfoundland to Minnesota and south to Florida, Mississippi, Louisiana and Arkansas, also Washington and Oregon. MO has collections from Quebec, Ontario, Minnesota, Wisconsin, South Dakota, West Virginia, Maine, Vermont, New Jersey, New York, Pennsylvania, Wyoming, Oregon, Washington and British Columbia. Based on its widespread distribution, Missouri and the Interior Highlands are well within the range of this species.

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Campylium radicale (P. Beauv.) Grout, Bryologist 12: 96. 1909.

Plants slender, in green tufts or mats, stems creeping, branching irregularly pinnately, few ovate to lanceolate paraphyllia on stem, leaves distant, erect to spreading, entire, rounded to base, abruptly acuminate, weakly channeled apex, stem leaves 0.9-1.5 mm long, thinly and long-decurrent, margins plane, costa single, ending without spine near or slightly above middle of leaf, cells smooth, linear, prosenchymatous with thin walls, median cells 6:1, upper cells 4:1, alar cells enlarged, differentiated, oblong, hyaline, largest 40 μm x 20 μm.

In the field with hand magnification *Campylium radicale* is a non-descript moss, and due to its lack of widely spreading or squarrose leaves (as seen in several common *Campylium* species), can be mistaken for species of *Amblystegium, Hygroamblystegium* or *Leptodictyum*. Initial observation of the leaves under a microscope recalls *Brachythecium rivulare* Schimp. in B.S.G., because of its long decurrencies, enlarged alar cells, costa ending above mid-point and deltoid base; however, the overall habit is much too small for that species. Hedenäs (1997) mentions paraphyllia occurring in *Campylium radicale* which is one of his reasons for recommending transfer of the species to *Amblystegium*. Hedenäs (1997) also discussed the typical weak apex channeling of the species, which in *Summers & Hudson 9431* was also noted to be very weak. The leaf decurrencies, distant and non-squarrose leaves, costa character, enlarged alar cells plus stem leaf size and shape make for fairly easy separation from other *Campylium* species.

Key to Species of *Campylium* for Interior Highlands of North America

1. Costa missing or very short and double 2
    2. Slender plants with leaves spreading to squarrose, serrulate, stem leaf length less than 0.9 mm, alar cells small, firm-walled. . . . . *C. hispidulum*
    2. Robust plants with leaves spreading, entire, stem leaf length more than 1.0 mm, alar cells enlarged, inflated, thin-walled . . . . *C. stellatum* var. *stellatum*
1. Costa single, ending near or slightly above the middle of leaf 3
    3. Stem leaves thinly and long-decurrent, erect to spreading when wet, distant . . . . *C. radicale*
    3. Stem leaves not to slightly decurrent, spreading to squarrose when wet, crowded 4
        4. Leaves spreading, lanceolate to ovate-lanceolate, gradually acuminate, alar cells inflated . . . . *C. polygamum*
        4. Leaves wide-spreading to squarrose, ovate-lanceolate, somewhat falcate, abruptly acuminate, alar cells small to slightly enlarged . . . . *C. chrysophyllum*

Acknowledgments: the author wishes to thank Bill Summers and Stan Hudson for permission to publish their collection, also Bruce Allen and Paul Redfearn for confirming the specimen.

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Montana Collections of *Scorpidium scorpioides* and *Meesia triquetra*

Joe C. Elliott [1] & Toby Spribille [2]

The mosses, *Meesia triquetra* and *Scorpidium scorpioides*, in Montana, are often associated with rich fens and are considered potentially imperiled by the Montana Natural Heritage Program because of species and habitat rarity. The U.S. Forest Service also designates them as "sensitive species" and, on federal lands, affords them special management status under the National Forest Management Act. In Europe, both of these species are rare as a result of acidification and eutrophication of fen habitats from pollution and water management practices (Odgaard 1988, Kooijman and Westhoff 1995).

Prior to this report, there were two known locations for *Scorpidium scorpioides* in Montana, Pine Butte Swamp (a fen), Teton County (Lesica 1986) and a collection near Columbia Falls, Flathead County (Williams 1902). There was one published location for *Meesia triquetra* in Montana, Pine Butte Swamp, Teton County (Elliott and Moore 1989).

This report identifies 15 sites in Montana with *Meesia triquetra* and 20 sites with *Scorpidium scorpioides*. Information presented in this report was obtained from our field collections and collections that were made by other Montana botanists and wetland biologists. We identify herbaria where specimens have been deposited as: MONTU (University of Montana); MRC (Missoula Research Center, Rocky Mountain Research Station, U.S.D.A. Forest Service, Missoula, MT); FORTINE (herbarium at the Murphy Lake Ranger Station, U.S.D.A. Forest Service, Fortine, MT); BUF (Clinton Herbarium, Buffalo Museum of Science); COLO (University of Colorado); UBC (University of British Columbia); ALTA (University of Alberta); and MO (Missouri Botanical Garden). We have looked at all specimens cited in this report.

Distribution and habitat

Meesia triquetra and *Scorpidium scorpioides*, circumboreal species, usually have high fidelity to rich fens (i.e., high concentrations of sodium bicarbonate, calcium, and magnesium; high electrical conductivities; and neutral or basic pH values), although they sometimes occur in wetlands that do not possess all of the typical attributes of rich fens (Montagnes 1990, Kooijman and Westhoff 1995).

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The North American distribution of *Meesia triquetra* includes Alaska, most of the Canadian provinces, the Great Lakes states, east to New York, and northern California (Montagnes 1990). One of us also collected *Meesia triquetra* from a rich fen in McHenry County, western North Dakota (*Elliott 1982*, MO). In the Rocky Mountains, *Meesia triquetra* has been found as far south as Wyoming (Cooper and Andrus 1994), in a high elevation fen (3000 m.) of the Wind River Range. *Meesia triquetra,* usually grows intermixed with other mosses and occasionally forms dense patches in wet depressions of fens and carrs.

Scorpidium scorpioides, typically grows floating or emergent in shallow water of fens or emergent on marly substrates of seeps and springs. It also grows as a submersed aquatic (to depths of 5 m.), attached to bottom substrates of lakes with high pH (8.0) and electrical conductivities of 250-350 mho/cm.(Pierce and Jensen in preparation). *Scorpidium* also has been found in the West in the Canadian provinces (Lawton 1971, Ireland et al 1997), Wyoming (Eckel 1996), and Colorado (Cooper 1991 and Cooper 1995). The *Scorpidium* record reported by Eckel (1996), from Wyoming is from the Swamp Lake Fen, Park County, a rich fen also harboring the rare species *Cinclidium stygium* (*Elliott 1943*, BUF). The Colorado collection, from an extreme rich fen, elevation 2,840 m., is the southernmost record for *Scorpidium* in the West.

Mosses typically occurring with *Scorpidium* and *Meesia*, are *Aulacomnium palustre*, *Calliergon giganteum*, *Campylium stellatum*, *Limprichtia revolvens*, *Bryum pseudotriquetrum*, *Rhizomnium magnifolium*, and *Tomentypnum nitens*. Less common associates include *Sphagnum warnstorfii, Hamatocaulis vernicosus, Helodium blandowii, Thuidium recognitum, Polytrichum strictum, Hypnum pratense*, and *Dicranum undulatum*. Rare associated mosses in Montana fens include: *Calliergonella cuspidata, Catascopium nigritum, Cinclidium stygium, Fissidens adianthoides, Pseudocalliergon turgescens, Meesia uliginosa*, and *Paludella squarrosa.*

The presence of *Meesia triquetra* with *Sphagnum squarrosum, S. angustifolium*, and *S. magellanicum*, species often associated with poor fens (Andrus 1980 and McQueen 1990), is rare in Montana, occurring at three sites (Drop Creek Fen, Lincoln County; Rock Creek wetlands, Ravalli County; and McGee Meadow, Glacier National Park). The association of *Meesia* with *S. angustifolium* and *S. magellanicum* also is rare in Alberta (Montagnes 1990).

Vascular plants, often growing in association with *Meesia* and *Scorpidium* in fens include: *Betula glandulosa, Menyanthes trifoliata, Carex aquatilus, Carex lasiocarpa, Carex limosa, Carex livida, Carex simulata*, and *Carex utriculata.* Species associated with *Scorpidium,* growing as submersed aquatics in lakes include

Chara sp., *Nuphar variegatum*, *Scirpus acutus*, *Scirpus subterminalis*, *Potamogeton natans*, *Potamogeton gramineus*, and *Utricularia vulgaris* (Pierce and Jensen in preparation). In general, fens that we visited appear to be similar in species composition to fens described farther north in Alberta, Canada by Slack et al (1980).

Meesia triquetra location sin Montana

Carbon County. Wet meadow along West Fork Rock Creek; 20 km. W. of Red Lodge; Sec. 34, T7S, R18E, Lat. 45.1745, Long. 109.4960); Elev. 2386 m.; *Elliott 1971* (MONTU).

Flathead County. Crystal Bench Fen, 13 km. N. of Columbia Falls; Sec. 9, T31N, R20W (Lat. 48.4649, Long. 114.1646); Elev. 1055 m.; *Spribille 3100* (FORTINE). Teepee Lake Fen; 16 km. N. of Polebridge; Sec. 3, T36N, R22W (Lat. 48.9060, Long. 114.4291); Elev. 1236 m.; *Greenlee 9902* (MONTU). Glacier National Park, McGee Meadow, 12 km. N. of West Glacier; Sec. 34, T33N, R19W (Lat. 48.3525, Long. 114.3525); Elev. 1190 m.; *Golinski 1628* (UBC). Magnesia Creek Fen; marly banks of rill, 8 km. S. of Trego; Sec. 7, T33N, R25W (Lat. 48.6461, Long. 114.8783); Elev. 1152 m.; *Spribille 3906* (FORTINE).

Glacier County. Fen at head of Flat Iron Creek; 11 km. W. of Browning on Blackfeet Indian Reservation; Sec. 16, T32N, R12W (Lat. 48.5395, Long.113.1632); Elev. 1455 m.; *Lesica s.n* (MONTU).

Lake County. Plum Creek Fen; foothills of Mission Mountains, 13 km. S. of Swan Lake; Sec.1, T23N, R18W (Lat. 47.7812 Long., 113.8497); Elev. 1012 m.; *Chadde and Shelly 569* (MRC). Swan River Research Natural Area; spring-fed domed fen, 6 km. S. Swan Lake; Sec.2, T24N, R18W (Lat. 47.8694, Long. 113.8660); Elev. 939 m.; *Elliott 2532* (MONTU).

Lincoln County. Bowen Creek Fen; 24 km. W. of Olney; Sec. 1, T31N, R26W (Lat. 48.4779 Long., 114.8606); Elev. 1445 m; *Elliott 2340* (MONTU). Drop Creek Fen; 35 km. N. of Libby; Sec. 13, T34N, R31W (Lat. 48.7097 Long.,115.5471); Elev.1515 m.; *Spribille 5726* (FORTINE). Rattlebone Fen; 1 km. S. of Rattlebone Lake; Sec. 26, T34N, R25W (Lat. 48.6805, Long. 114.7911); Elev. 1060 m.; *Elliott 2799* (MONTU), *Spribille 3582* (FORTINE). Wigwam River Fen; 0.5 km S. of Canadian border; Sec. 2, T37N, R25W (Lat.48.9959, Long. 114.8142); Elev. 1394 m.; *Spribille 3317C* (FORTINE).

Ravalli County. Meadow Creek Fen; hummocks in fen, 13 km. E. of Sula; Sec. 10, T.1N, R18W (Lat. 45.8505, Long. 113.8248); Elev.1760 m.; *Heidel s.n.* (MONTU). Rock Creek wetlands; 10 km. N.W. Darby, 1 km. E. of Lake Como; Sec. 28, T4N, R21W (Lat. 46.0730, Long. 114.2120); Elev. 1206 m.; *Chadde and Shelly 569* (MRC).

Teton County. Pine Butte Swamp (fen); 27 km. W. of Choteau; Sec.12, T 24N, R8W, (Lat. 47.8466, Long. 112.5674); Elev. 1,402 m; *Elliott 1403* (MONTU).

Scorpidium scorpioides locations in Montana

Flathead County. Ambrose Fen; shallow water emergent; 3 km S. of Creston; Sec. 26 and 27, T28N, R20W; (Lat.48.1610, Long.114.1060) Elev. 882 m.; *Elliott 2524*, (MONTU), *Greenlee 9808* (MONTU). Bent Flat Fen; patterned fen; 8 km. E. of Spotted Bear Ranger Station; Sec. 11, T25N, R15W (Lat.47.9460, Long. 113.4519); Elev. 1227 m.: *Chadde and Shelly 532* (MRC). Collins Fen; marl flats; confluence of Lime and Magnesium creeks, 6.5 km. S. of Trego; Sec. 6, T33N, R25W (Lat. 48.3875, Long. 114.5300); Elev. 1067 m.;

Spribille 5472 (FORTINE). Fire Lake (Smokey Lake); floating in alkaline water; 12 km. S. of Stryker,; Sec. 17, T33N, R24W (Lat. 46.6238, Long. 114.7260); Elev. 1109 m.; *Spribille 9227* (FORTINE). Paul Creek Fen; 10 km. S. of Stryker; Sec. 27, T33N, R25W (Lat. 48.5983, Long. 114.8028); Elev. 1327 m.; *Spribille 9175* (UBC). Teepee Lake Fen; 16 km. N.W. of Polebridge; Sec. 3, T36N, R22W (Lat. 48.9060, Long. 114.4291); Elev. 1236 m.; *Greenlee 9903* (MONTU).

Glacier County. Flat Iron Fen; 11 km. W. of Browning, Blackfeet Indian Reservation; Sec. 16, T32N, R12W (Lat. 48.5395, Long. 113.1632); Elev. 1455 m.; *Lesica s.n.* (MONTU).

Lake County. Swan Lake Oxbow; calcareous seep and spring complex, 2 km. S. of Swan Lake; Sec. 35, T25N, R18W (Lat. 47.8887, Long. 113.8550); Elev. 909 m.; *Elliott 1825* (MONTU).

Lewis and Clark County. Wood Lake Fen; 40 km W. of Augusta; Sec. 26, T20N, R10W (Lat. 47.4588, Long. 112.8393); Elev. 1697 m.; *Cooper s.n.* (MONTU).

Lincoln County. Blue Lake; submerged to depth of 1-5 m; 1.5 km south of Stryker; Sec. 1, T34N, R25W (Lat. 48.6580, Long. 114.7670); Elev. 991 m.; *Pierce 1621* (MRC). Cody Lake Fen; emergent in fen and submersed in open water to depth of 3m.; 15 mi. S.E. Libby; Sec.6, T.29N, R28W (Lat. 48.3088, Long. 115.2319); Elev. 1424 m.; *Elliott 2788* (MONTU). Dudley Slough; emergent on marly flats and floating in open water; 3 km W. of Trego; Sec.14, T34N, R26W (Lat. 48.7041, Long. 114.9192) ; Elev. 1030 m.; *Elliott 1584* (MONTU). Hidden Lake; marl flats, 2 km W. of Stryker; Sec.35, T34N, R25W (Lat. 48.6719, Long. 114. 7938; Elev. 970 m.; *Spribille 5320* and *5336* (FORTINE). Horseshoe Lake; submerged to depth of 2-4 m; W. of Happy's Inn; Sec. 23 T27N, R28W (Lat. 48.0828, Long.115.1721); Elev. 1014 m.; *Pierce 1606* (MRC). Murphy Lake; submerged to a depth of 1m; 4 km. S.E of Fortine ; Sec. 5, T34N, R25W (Lat. 48.7347, Long.114.8590); Elev. 909 m.; *Pierce s.n.* (MRC). Rattlebone Fen; floating, woven into caddis fly casings and submerged in open water to a depth of 1 m.; 1 km S. of Rattlebone Lake; Sec. 26, T34N, R25W, (Lat. 48.6805, Long. 114.7911); Elev. 1060 m.; *Spribille and Elliott 5139* (ALTA and COLO).

Missoula County. Boles Creek, Elk Meadow; 26 km. N. of Missoula; Sec. 35, T16N, R15W (Lat. 47.1019, Long. 113.7008); Elev. 1703 m.; *Pierce 1240* (MONTU).

Teton County. Pine Butte Swamp (fen); emergent in shallow water; 27 km. W. of Choteau; Sec. 12, T24N, R8W (Lat. 47.8466, Long. 112.5674); Elev. 1,402 m; *Elliott 1397* (MONTU) and *Lesica 2538* (COLO). Seeps along Muddy Creek at Black Leaf Wildlife Management Area, 22 km. W. of Bynum; Sec. 14, T26N, R8W (Lat. 48.0059, Long. 112.6014); Elev.1454 m.; *Elliott 2814* (MONTU). Fen at head of Cow Creek; 24 km. W. of Bynum, Sec.6, T26N, R8W, (Lat. 48.0340 Long. 112.6818); Elev 1485 m.; *Lesica s.n.* (MONTU).

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Lichens Collected at Cape Belknap near Alert, Northeastern Ellesmere Island

Eric Steen Hansen

Abstract. A total of 39 species of lichens are reported from the lichenologically badly known northeastern Ellesmere Island. *Gyalidea lecideopsis* is new to eastern North America. Northward range extensions in North America are reported for 10 species, viz. *Caloplaca invadens*, *Diploschistes muscorum*, *Gyalidea lecideopsis*, *Lecanora dispersa*, *Lecidea atrobrunnea*, *Ochrolechia frigida*, *Psora decipiens*, *Rinodina calcigena*, *Solorina bispora* and *Toninia arctica.*

Introduction. On the way to Washington Land in western North Greenland the members of the Kane Basin Expedition 1999 organized by the Geological Survey of Denmark and Greenland (GEUS) and the Danish Polar Center (DPC)) spent a few days at the Canadian Forces Station, Alert (82°30′N, 62°20′W). The 8. th of July the author got an opportunity to collect lichens at Cape Belknap located c. 2 km east of Alert. Although the collection is small, it is of interest because of several range extensions. The lichen flora of northeastern Ellesmere Island has previously been mapped by Thomson (1984, 1994). Bruggemann & Calder (1953) have given a survey of previous botanical investigations in northeastern Ellesmere Island.

The vegetation around Cape Belknap consists of marshy patches, fell-fields and open heaths characterized by the sparse occurrence of, for example, *Salix arctica*, *Saxifraga oppositifolia*, *S. caespitosa*, *Draba bellii*, *Poa abbreviata* and different lichens and mosses. *Ranunculus sabinei* is comparatively common near the station, but was not found at the cape. The heaths occur on hummocky polygon-soil. The tussocks are from c. 10 cm to 1 m broad and up to 7 cm high. Lichens such as *Buellia elegans*, *Cladonia pocillum*, *Diploschistes muscorum*, *Fulgensia bracteata*, *Psora decipiens*, *Solorina bispora* and *Toninia arctica* form distinct soil crusts. Mosses (not identified) grow abundantly in the fissures between the tussocks. Calcareous stones covered by lichens occur scattered in the area.

Material and Methods. 45 specimens from the investigation area have been studied with Zeiss light microscopes. The material is deposited in herbarium at Copenhagen (C). An asterisk in front of a lichen name in the following list indicates that it represents a northward

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extension of the taxon in North America. With a few exceptions the nomenclature follows Santesson (1993).

List of Species

Alectoria nigricans (Ach.) Nyl. (9922) On soil.

Alectoria ochroleuca (Hoffm.) A. Massal. (9920) On soil.

Aspicilia candida (Anzi) Hue (Syn. *Aspicilia nikrapensis* Darbish). (9936a) On calcareous stones.

Buellia elegans Poelt (9920*)* On mosses and soil. This species, which has been previously reported from arctic North America (Poelt & Sulzer 1974; Thomson 1994), probably is common in dry areas in North Greenland (Kronprins Christian Land, Washington Land). These collections are under revision and accordingly cannot be cited here.

Buellia papillata (Sommerf.) Tuck. (9927) On *Cladonia pocillum* and other plants.

* *Caloplaca invadens* Lynge (9931a) Parasitic on *Placynthium asperellum* on calcareous stones.

Candelariella aurella (Hoffm.) Zahlbr. (9936b) On calcareous stones.

Cetraria islandica (L.) Ach. (9909) On mosses and soil.

Cetraria muricata (Ack.) Eckfeldt (9928) On soil.

Cladonia pocillum (Ach.) Grognot (9901) over mosses on soil.

* *Diploschistes muscorum* (Scop.) R. Sant. (9904) On mosses and soil.

Flavocetraria cucullata (Bellardi) Kärnefelt & Thell (9926) On soil.

Flavocetraria nivalis (L.) Kärnefelt & Thell (9913; 9921) On soil.

Fulgensia bracteata (Hoffm.) Räsänen (9903) On mosses and soil.

* *Gyalidea lecideopsis* (A. Massal.) Lettau (9938) On calcareous stone. In North America the species is known previously from one locality situated in western Alaska (Thomson & Murray 1988). It is very rare and possibly neglected in Greenland, too (Hansen & Graff-Petersen 1986; Hansen, Poelt & Vezda 1987).

Hypogymnia subobscura (Vain.) Poelt (9929) On soil.

* *Lecanora dispersa* (Pers.) Sommerf. (9932b) On calcareous stones.

Lecanora epibryon (Ach.) Ach. (9911; 9914) On mosses on soil.

Lecanora marginata (Schaer.) Hertel & Rambold (9933) On calcareous stones.

* *Lecidea atrobrunnea* (Ramond ex Lam. & DC.) Schaer. (3939b) On stone manured by birds.

Lecidella bullata Körb. (9932a) On calcareous stones. The species probably is very common on calcareous stones and rocks in North and North East Greenland. However, the Greenland collections of *Lecidella bullata* are still under revision.

Leproloma vouauxii (Hue) J. R. Laundon (9918) On mosses on soil.

* *Ochrolechia frigida* (Sw.) Lynge (9916) On soil.

Peltigera rufescens (Weiss) Humb. (9905; 9924) On mosses and soil.

Pertusaria dactylina (Ach.) Nyl. (9930) On mosses.

Physconia muscigena (Ach.) Poelt (9906; 9923) On mosses and soil.

Placynthium asperellum (Ach.) Trevis. (9934) On calcareous stones.

Polysporina simplex (Davies) Vezda (9939a) On calcareous stones.

* *Psora decipiens* (Hedw.) Hoffm. (9902) On soil.

Rhizocarpon geminatum Körb. (9931b) On calcareous stones.

Rhizocarpon viridiatrum (Wulfen) Körb. (9937) On stone.

* *Rinodina calcigena* (Th. Fr.) Lynge (9933b) On stones.
* *Solorina bispora* Nyl. (9908) On soil.
Sporastatia testudinea (Ach.) A. Massal. (9935) On calcareous stone.
Stereocaulon alpinum Laurer (9910) On soil.
Thamnolia subuliformis (Ehrh.) Culb. (9915) On soil.
Thelidium pyrenophorum (Ach.) Mudd (9940) On calcareous stone.
* *Toninia arctica* Timdal (9912; 9925) On soil.
Xanthoria elegans (Link) Th. Fr. (9919) On calcareous stone manured by birds.

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The genus *Dicranodontium* (Musci: Dicranaceae) in Maine

Bruce Allen

Dicranodontium is a widespread genus of 7 species (Frahm 1997) found in the Western Hemisphere from Alaska and Newfoundland to Bolivia, throughout Eurasia, the Himalayan region, Southeast Asia, Malesia and Hawaii. Frahm (1997) considered *Dicranodontium* holarctic in distribution, but the center of distribution for the genus seems to be the Himalayan region where 6 of the 7 species occur. The genus was revised world-wide by Frahm (1997). Ireland (1989) reviewed the Canadian species of *Dicranodontium.*

Dicranodontium species are medium- to large-sized mosses typically having narrow to setaceous leaves with short, ovate bases, broad, excurrent costae having both dorsal and ventral stereid cells, long, narrow, upper leaf cells, well-differentiated alar cells, stems with a central strand, nonsheathing perichaetial leaves, and cygneous setae. Several *Dicranodontium* species have distinctive basal leaf cells in which the inner cells are enlarged, variously thin-walled, and hyaline while the outer cells are narrow, elongate, and thick-walled. The degree to which the inner basal cells are differentiated, however, is variable and appears to be age-influenced since older leaves have thicker-walled inner cells than younger leaves. Although some *Dicranodontium* species have consistently thick-walled inner basal cells, porose inner basal leaf cells are not found in any *Dicranodontium* species. A critical feature of the genus is seen in its costal cross-section (Fig. 1 f). Like many other mosses the *Dicranodontium* costa has guide cells, ventral and dorsal stereid cells, as well as dorsal and ventral epidermal layers of somewhat enlarged cells. There is nothing unusual about the dorsal side of the costal cross-section. On the ventral side, however, the guide cells occupy superfical positions at both sides of the broad costa, and a median position toward the middle of the costa, thus the ventral stereids and superfical epidermal cells are found only in a "pocket" toward the center of the costa. This type of costa cross-section is also seen in *Brotherobryum* (Allen 1984) and *Dicranum scoparium* (Kawai & Walther 1969); it may indicate a relationship with the subfamily Dicranoideae.

Dicranodontium is usually placed in the subfamily Campylopodioideae (Brotherus 1924, Frahm 1991, 1997) where it can be difficult to distinguish from *Atractylocarpus*. Often the two genera are separated by the degree of erectness of their moist setae and sexuality. In *Atractylocarpus* the setae are erect to flexuose and the plants are autoicous, in *Dicranodontium* the setae are cygneous and the plants are dioicous.

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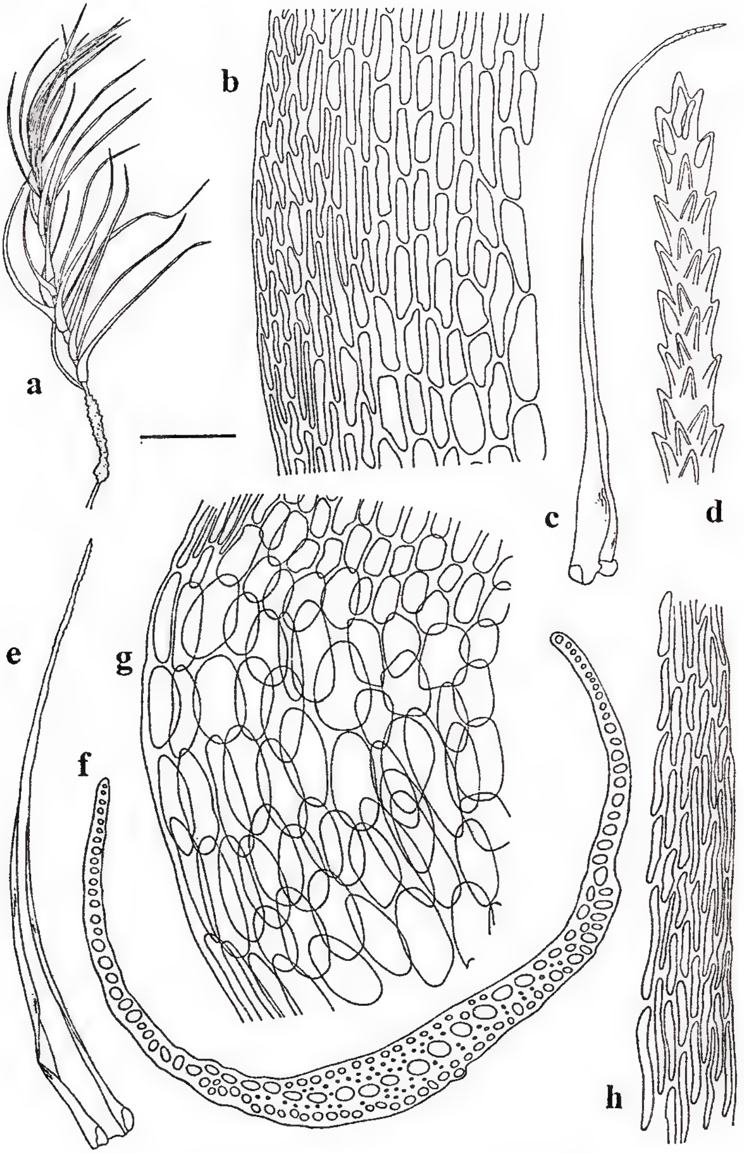

Figure 1. *Dicranodontium denudatum* a. Habit. b. Basal leaf cells. c. & e. Leaves. d. Leaf apex. f. Cross-section from lower half of leaf. g. Alar cells. h. Median leaf cells. Scale bar in mm: bar = 0.05 (b,d,g,h); bar = 0.07 (f) bar = 0.9 (c,e); bar = 1.79 (a). All figures from *Holmes 138* (MO).

Williams (1913) considered the two genera synonymous because the setae of these two genera are variability in stance. Further support for this view (Allen 1991, 1994) was seen in a Central America species (*Dicranodontium intermedium* Allen) that is autoicous like *Atractylocarpus* but had cygneous setae like *Dicranodontium*. Frahm (1997), noting *D. intermedium* lacked the typical *Dicranodontium* costal cross-section and had porose inner basal leaf cells, correctly excluded the species from *Dicranodontium*.

The name *Dicranodontium* combines the Greek "*dikranon* – a pitchfork" and "*odont-* – relating to teeth" in reference to its divided peristome teeth.

Dicranodontium Bruch & Schimp. *in* B.S.G., Bryol. Eur. 1: 159. 1847.

Plants erect, large to medium-sized, yellow-brown to greenish-yellow; stems radiculose, sparsely and irregularly branched tufted. Leaves crowded, erect to secund, subtubulose, setaceous from an ovate, sheathing base, often deciduous; margins serrulate in upper third, entire below; costa to 2/3 the leaf width at base, long-excurrent, in cross-section with dorsal and ventral stereid bands; median leaf cells linear, basal cells rectangular; alar cells variously differentiated, frequently fugacious or fragile. Dioicous. Setae erect to slightly flexuose or strongly cygneous when moist, erect and twisted when dry; capsules erect or inclined, weakly furrowed; opercula long-rostrate; well-developed annuli absent; stomata absent; peristome teeth 16, divided to the base, vertically striolate below, papillose above. Calyptrae cucullate, not fringed. n = 11, 12 (Fritsch 1991).

Dicranodontium denudatum (Brid.) Britt. *in* Williams, N. Am. Fl. 15: 151. 1913.
Dicranum denudatum Brid., Muscol. Recent. 1: 184. 1806. *Didymodon denudatus* (Brid.) Lindb., Musci Scand. 25. 1879. *Campylopus denudatus* (Brid.) Kindb., Bih. Kongl. Svenska Vetensk-Akad. Handl. 7: 87. 1883.

Plants in loose, green to yellowish-green tufts. Stems 2–4(8) cm tall, rhizoids reddish-brown; stems in cross-section with 1–2 rows of small, more or less firm-walled epidermal cells, central strand well-developed. Leaves 3–8 mm long, erect-flexuose to falcate-secund, setaceous from an ovate somewhat clasping base, subtubulose to tubulose throughout, often deciduous; margins entire below, serrulate above; costae occupying 1/2–2/3 the leaf base and filling the upper part of leaf, serrulate to serrate at back above, not sharply demarcated from the lamina, in cross section with somewhat enlarged ventral and dorsal surface cells, single row of guide cells, ventral and dorsal stereid bands well-developed; upper cells rectangular to linear, 24–47 µm x 7 µm; basal cells enlarged and rectangular near the costa, narrowly rectangular to elongate at the margins, 24–80 µm x 4–8 µm; alar cells inflated, usually auriculate, hyaline or reddish. Sporophytes unknown in Maine.

"Seta 6–10 mm long, erect, twisted and flexuose, curved when wet in young sporophytes. Capsules oblong, ovoid, elliptic to short cylindric, 1.5 2 mm long, smooth. Operculum as long as capsule. Calyptra smooth at base. Spores 10-15 μm." (Frahm 1997).

On soil, over acidic outcrops, cliffs, rocks or boulders, on humus, rotten logs and tree stumps. In Maine known from Piscataquis (*Hodgkins* MAINE) and Washington (*Holmes 138* MO) Counties.

Dicranodontium denudatum can be recognized in the field by its setaceous, erect-flexuose to falcate-secund leaves and the presence of partially to fully denuded stems. The denuded stems result from its readily deciduous leaves. Microscopically, the combination of its auriculate leaf bases, inflated alar cells, narrowly rectangular to linear upper leaf cells, and broad costae that have a *Dicranodontium*-type cross-section (see discussion above) will separate it from all other species in the Maine flora.

Ireland (1989) found that the species was often confused with *Dicranella heteromalla* (Hedw.) Schimp., *Ditrichum flexicaule* (Schwaegr.) Hampe, *D. pallidum* (Hedw.) Hampe, *Paraleucobryum longifolium* (Hedw.) Loeske, and *Orthodicranum fulvum* (Hook) Roth *in* Cas. *Dicranodontium denudatum* differs from the first three species in having well-developed, inflated alar cells. *Paraleucobryum longifolium* differs from *D. denudatum* in having a greyish-green color and a three-layered costa that in cross-section consists of a ventral row of hyalocysts, a median row of chlorocysts, and a dorsal row of hyalocysts alternating with chlorocysts. *Orthodicranum fulvum* has lanceolate leaves that are irregularly crispate when dry, and short-rectangular to irregularly subquadrate upper leaf cells.

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Lichenological Serendipity in Putnam County, New York

Richard C. Harris and William R. Buck

Casual collections made in connection with a general natural resource inventory by the Putnam County Environmental Management Council have led to the discovery of two seldom collected species of lichens, *Macentina dictyospora* A. Orange and *Thelocarpon intermediellum* Nyl. Their discovery is essentially serendipitous since both have tiny yellowish fruiting bodies growing on wood which, when dry, are for all practical purposes invisible. Further, their ascomata may be produced seasonally unlike the vast majority of lichens. It is, therefore, a matter of pure luck that one looks closely at wood in the right stage of decomposition, at the right time of year, at a time when the wood is wet enough to render the fruiting bodies "visible" as yellow dots.

Both lichens are easily identified with a compound microscope. The perithecial *Macentina* has oblong asci embedded in a gelatinous matrix which reacts orange-red with iodine reagents, eight ascospores per ascus, each of which is usually divided by five cross walls, and 1-several of the resulting cells may be further subdivided by a longitudinal wall. The perithecioid apothecial *Thelocarpon* has club-shaped asci widest at the base containing hundreds of tiny single-celled ascospores.

The *Macentina* is known only from one other site in North America (Will-Wolf, 1998). Over the last 30 years Harris has run across the *Thelocarpon* only a few times. Both are so seldom collected that one cannot say much about their habitat requirements. The *Macentina* was found on the base of a tree in a hardwood forest at the edge of a swamp. The *Thelocarpon* was in secondary oak woods on a decorticated log, presumably oak, decayed sufficiently so that the outer layers were soft and water retentive.

If these and other lichens like them were big and showy, one would consider them exceedingly rare. We suspect they are not, but without further strokes of luck or until a truly exhaustive search is made, we just can't say. Putnam County, New York is certainly not an area to lead one to expect lichenological riches. We encourage those with a handlens, time to spare and a minimal amount of energy to go out on nice Spring or Autumn day after a rain to see what they can find on an old log.

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Macentina dictyospora A. Orange

New York. PUTNAM COUNTY: Town of Kent, S side of Bowen Road, just NE of NY 52, 41°29'N, 73°41'W; hardwood swamp; 5 March 2000, *William R. Buck 36731* (NY).

Thelocarpon intermediellum Nyl.

New York. PUTNAM COUNTY: Town of Kent, Clarence Fahnestock Memorial State Park, along Appalachian Trail from SW end of Canopus Lake then along its western shore, 41°27-28'N, 73°50'W, 300-340 m; mesic oak-been woods with extensive rock outcrops; 15 November 1998, *William R. Buck 35210* (NY).

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Mosses of the Great Plains *Homalothecium nevadense* (Musci: Brachytheciaceae) New to North Dakota

Carl Darigo

Homalothecium nevadense (Lesq.) Ren. & Card. is a pleurocarpous moss often found on rocks, decaying wood and soil in forest or open habitats. The species is endemic to western North America, including the western part of the Great Plains, and has been reported in Alberta, British Columbia, Washington, Oregon, California, Idaho, Montana, Wyoming, Colorado, Nevada and Utah (Lawton 1971, Hofmann 1998, Ireland et al 1987). Steve Churchill (pers. comm.) has also collected *H. nevadense* in South Dakota. This paper reports *Homalothecium nevadense* new to North Dakota.

Homalothecium nevadense was collected 17 June 1999, on the south bank of the Missouri River in Mercer County, approximately 35 miles northwest of Bismarck, North Dakota. The collection was made 10 yards west of Stanton Boat Access ramp, ¼ mile north of Hwy 200A and ¼ mile west of Stanton Station Power Plant, elevation 1,780 ft, *Darigo & Darigo 3367* (MO). The moss was growing in scattered, small patches on an unshaded, north-facing, soil river bank in a general rural-agricultural habitat, mixed with more abundant *Amblystegium serpens* (Hedw.) Schimp. in B.S.G. var. *serpens*.

Homalothecium nevadense (Lesq.) Ren. & Card., Bot. Gaz. 13: 202. 1888.

Plants creeping, pinnately branched or tufted, shiny, stem leaves 2.0-2.5 mm x 0.5 mm., lanceolate with straight sides resembling an isosceles triangle, strongly plicate from base almost to apex, entire, somewhat decurrent, median cells smooth, ca. 12:1, costa ¾ length of leaf, none to no more than one row of short, transverse cells across leaf base, alar cells irregular, quadrate to oblong, cell outlines not clearly visible, only 1-4 along margin. Sporophytes not seen.

The North Dakota specimen has alar cells matching those of ssp. *nevadense* (Hofmann 1998), versus ssp. *aeneum* (Mitt.) H. Hofmann which has alar cells mainly quadrate with clearly visible outlines and 2-7 along margin. The latter subspecies was treated at the species level as *H. aeneum* (Mitt.) Lawt. by Lawton (1971).

Acknowledgments: the author wishes to thank Bruce Allen for confirming the specimen, Steve Churchill for supplying Great Plains data and Dolly Darigo for her collecting help.

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The genus *Dicranoweisia* (Musci: Dicranaceae) in Maine

Bruce Allen

Dicranoweisia, with 21 species (Crosby *et al.* 1999), is primarily a temperate genus (15 species) concentrated in the south temperate regions of the world (12 species). The center of distribution for the genus appears to be southern South America (9 species). Koponen & Norris (1990) characterized the genus as having crispate leaves with differentiated but not strongly developed alar cells, and mostly undivided peristome teeth. Other features usually associated with *Dicranoweisia* include leaf cells with longitudinal, cuticular thickenings that extend over several cells, an autoicous sexual condition, sheathing perichaetial leaves, and erect capsules. The genus is traditionally placed in the Dicranaceae (Brotherus 1924, Crum & Anderson 1981, Vitt 1984, Norris & Koponen 1990). In tropical areas *Dicranoweisia* is difficult to separate from *Holomitrium* Brid, e.g., Norris and Koponen (1990) distinguished the two on sexuality (*Holomitrium* is pseudautoicous or dioicous) and the presence of more enlarged and sheathing perichaetial leaves in *Holomitrium.* Since *Dicranoweisia* is primarily a temperate genus it may be that a worldwide revision of it would exclude the tropical species now placed in the genus.

Edwards (1979) described the peristome of *Dicranoweisia* as similar to that of *Seligeria* B.S.G. in that it appeared to be a double peristome in which the exostome was present as a “prostome” at the very base of an otherwise haplolepideous peristome. On the basis of this peristome interpretation Ochyra (1993, 1998) transferred *Dicranoweisia* into the Seligeriaceae. Edward’s association of the *Seligeria* and *Dicranoweisia* peristomes, however, is in error.

The peristome in *Dicranoweisia* is undisputedly haplolepidous: secondary deposition occurs on the inner tangential walls of the PPL and outer tangential walls of the IPL, and it has a **2:3** PPL to IPL ratio. It is unusual in that the teeth are deeply inserted within the capsule mouth and the lowermost lamellae of the teeth are weakly thickened, smooth and hyaline. As a result of the last feature the teeth (at least in *D. crispula*) are fragile and often break at the base. Although most collections of *D. crispula* have sporophytes, de-operculate capsules rarely have intact peristome teeth. Edward’s interpretation of an exostomal “prostome” in *Dicranoweisia* depends on the presence of a median line in this basal region, indicating the OPL of the capsule is involved in its formation. I have found no evidence of a median line on the hyaline portion of the peristome teeth in *D. crispula.* This is also apparent in Crum & Anderson’s (1981)

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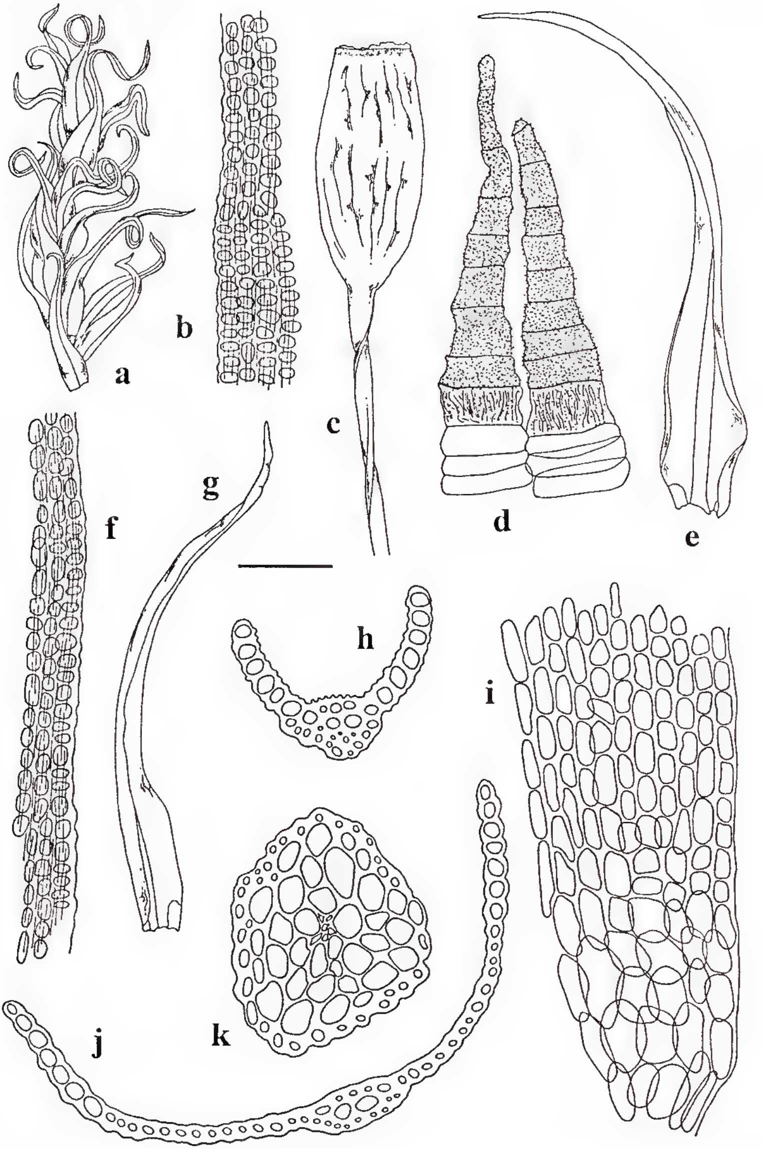

Figure 1. *Dicranoweisia crispula* a. Habit. b. Upper leaf cells and margin. c. Capsule. d. Peristome teeth, dorsal (outer) surface. e. & g. Leaves. f. Lower leaf cells and margin. h. Cross-section from upper part of leaf. i. Basal and alar cells. j. Cross-section from lower part of leaf. k. Cross-section of stem. Scale bar in mm: bar = 0.05 (b,d,f,h,i,j,k); bar = 0.5 (c,e,g); bar = 1.21 (a). Figure a from *Collins s.n.* (MO), figures b,c,e–k from *Allen 13282* (MO, figure d from *Viereck 1259a* (MO).

peristome illustration of *D. crispula.* The peristome of *Holodontium strictum* (Hook. f. & Wils.) Ochyra further corroborates the absence of a median line in this area of the peristome. *Holodontium* and *Dicranoweisia* are closely related and both have the same type of peristome, except in *Holodontium* the hyaline "prostome" is exceptionally well-developed, reaching 1/3 the tooth length. Ochyra's (1993) illustration of this peristome (Fig. 3: 24) has no median line at the base of the teeth.

Longitudinal sections of the *Dicranoweisia* peristome (Edwards 1979, Ochyra 1993) show there is peristome formation to the outside of the major haplolepidous region. This outside formation, as judged by its lack of a median line, appears to occur on the outer tangential walls of the PPL and not from the OPL which apparently is the case in the *Seligeria*-type of peristome. Furthermore, from its thin, hyaline nature this structure appears to represent primary rather than secondary deposition. Thus, the outer "prostome" seems to be the result of a simple failure of the primary outer tangential walls of the PPL to disintegrate, as usually happens in a haplolepidous peristome, rather than an elaboration of the haplolepideous peristome or a vestigial diplolepideous structure. Careful examination of other haplolepideous peristomes may show the feature to be more widespread.

The name *Dicranoweisia* combines the generic names *Dicranum* and *Weissia* in reference to its resemblance to those genera.

Dicranoweisia Lindb. *ex* Milde, Bryol. Siles. 48. 1869.

Plants in dense, green to yellowish-green mats. Stems irregularly branched, rhizoids red of two types, slender, branched ones clustered at base of stems or large, mostly unbranched ones from the leaf axils; stems in cross-section with small, firm-walled epidermal cells, central strand present. Leaves crispate and curled when dry, erect-spreading to erect-flexuose when wet, lanceolate to oblong-lanceolate, concave below, subtubulose above; costa percurrent, in cross section with somewhat enlarged ventral and dorsal surface cells, single row of guide cells, ventral and dorsal stereid bands present; upper cells in distinct longitudinal rows, thick-walled, with cuticular ridges that appear as papillae in cross-section; basal cells short- to long-rectangular or linear, firm-walled; alar cells enlarged, bulging, thin-walled, brownish-red, a times weakly differentiated. Autoicous. Perigonia bud just below the perichaetum; perichaetial leaves convolute-sheathing. Setae elongate. Capsules ovoid, elliptic to short cylindric, stomata in capsule neck; annuli present. Opercula conic-rostrate. Peristome of 16, usually entire teeth inserted deeply within capsule mouth, basal 3–4 lamellae hyaline, smooth, fragile, upper parts reddish-orange, smooth or striate on lower dorsal surface, densely papillose above, papillose on ventral surface, dorsal trabeculae strongly thickened, ventral trabeculae weakly thickened. Calyptrae cucullate. n = 11, 14 (Fritsch 1991).

Dicranoweisia crispula (Hedw.) Milde, Bryol. Siles. 49. 1869.
Weissia crispula Hedw. Sp. Musc. Frond. 68. 1801.

Plants in dense, green to yellowish-green mats. Stems to 10 mm tall, irregularly branched, rhizoids red of two types, slender, branched ones clustered at base of stems or large, mostly unbranched ones from the leaf axils; stems in cross-section with 1–2 rows of small, firm-walled epidermal cells, central strand weakly developed. Leaves 2–3.5 mm long, crispate and curled when dry, erect-spreading to erect-flexuose when wet, lanceolate to oblong-lanceolate, concave below, subtubulose above; margins entire below, entire to minutely crenulate above; costa percurrent, in cross section with somewhat enlarged ventral and dorsal surface cells, single row of guide cells, ventral and dorsal stereid bands present; upper cells in distinct longitudinal rows, subquadrate to oblate, at times triangular, thick-walled, with cuticular ridges that appear as papillae in cross-section, 6–12 µm x 2–10 µm; basal cells short- to long-rectangular or linear, firm-walled, 18–60 µm x 4–10 µm; alar cells enlarged, bulging, thin-walled, brownish-red. Autoicous. Perigonia bud just below the perichaetum; perichaetial leaves convolute-sheathing. Setae 7–14 mm long, yellow, becoming reddish with age. Capsules erect, ovoid, elliptic to short cylindric, 1.5–2 mm long, longitudinally wrinkled when dry, stomata in capsule neck; annuli rudimentary, adhering to capsule mouth after dehiscence. Opercula conic-rostrate, 1.5 mm long. Peristome of 16, entire teeth inserted deeply within capsule mouth, basal 3–4 lamellae hyaline, smooth, fragile, upper parts reddish-orange, striate on lower dorsal surface, densely papillose above, papillose on ventral surface, dorsal trabeculae strongly thickened, ventral trabeculae weakly thickened. Calyptrae cucullate, smooth, Spores smooth to lightly roughened, 12–16 µm.

On soil, over acidic outcrops. In Maine known from Piscataquis (*Collins* MO) County.

Dicranoweisia crispula is a circumboreal species recently reported (Ochyra 1998) from southern South America and Antarctica. In northeastern North America it is a rare, montane species and is known in Maine only from Mt. Katahdin. The single Maine collection of *Dicranoweisia crispula* was made 100 years ago. Distinguishing features of the species include its small size, yellowish-green color, strongly crispate leaves, and entire peristome teeth, The best diagnostic feature of *D. crispula*, however, is the presence of long, longitudinal, cuticular thickenings that extend over several leaf cells.

Orthodicranum montanum is similar to *D. crispula* in its small size, in having crispate leaves with poorly developed alar cells, upper leaf cells at times roughened-papillose, and erect capsules. It differs from *D. crispula* in its bright green color, dioicous sexual condition, and divided peristome teeth. *Amphidium mougeotii* (B.S.G.) Schimp. has flexuose-contorted leaves, is similar to *D. crispula* in size, and both species have the same type of leaf cell ornamentation. It differs from *D. crispula* in its dark-green color, linear-lanceolate leaves, lack of alar cell development, dioicous sexual condition, and shortly exserted, eperistomate capsules. *Cynodontium alpestre* (Wahlenb.) Milde is similar to *D. crispula* in size in having crispate leaves, an autoicous sexual condition, and erect capsules. It differs from *D. crispula* in having bistratose leaf margins, irregularly papillose to smooth leaf cells, no alar cell development, and ribbed capsules with divided peristome teeth.

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Mosses from Calcareous Fens in Western North Dakota

Joe C. Elliott

Calcareous fens in western North Dakota are rare habitats that support a diverse flora, including many rare species, restricted to the cool, saturated fen environment. Dominant vegetation of fens is distinctive and is usually dominated by sedges and mosses (Moore and Bellamy 1974). Duxbury (1987) reported that about 20 species of rare vascular plants grow in North Dakota fens.

The moss flora of North Dakota has not been extensively studied and few collections appear to be from fens. Ikenberry (1932) reported that the relatively dry climate and gentle topography of North Dakota are not conducive to the best development of mosses. He identified 106 species and varieties of mosses from throughout the state. His collections, that appear to be from fens, are *Aulacomnium palustre, Tomentypnum nitens*, and *Helodium blandowii* from sites near Sheldon and Venlo, in southeastern North Dakota. He described the collection sites as grassy, open marshes.

Blaney and Norris (1987) and Bilderback (1987) studied bryophytes from the Little Missouri Badlands of Theodore Roosevelt National Park. They identified 60 and 105 species, respectively, but none of their collections were from fens.

Churchill (1982), Steinauer and Churchill (1998), and Churchill and Steinauer (1999) also reported on mosses from North Dakota, but none of their collections appear to be from North Dakota fens.

In June of 1992, I collected and identified mosses from the Towner and Denbeigh fens in McHenry County and the Smishek Lake Fen in Burke County. Towner Fen (T157N, R75W, Sec. 18), about 65 acres in size, is 4.5 miles north of the community of Towner and is formed by groundwater discharge at the base of a hillside that joins the floodplain of the Souris River. A shrub canopy of bog birch dominates this fen.

Denbeigh Fen (T155N, R77W, Sec. 25), 1,020 acres in size, is the one of the largest fens in North Dakota, supporting over 150 species of vascular plants, at least 19 of them rare (Heidel 1987). It is located in a broad, abandoned meander of the Souris River, about 8 miles north and 4 miles east of the community of Karlsruhe. Studies of peat formation at Denbeigh Fen (Malterer et al 1988) determined that peat has formed at a very high rate of 10.2 cm per year over a period of about 5000 years.

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The Smishek Lake Fen (T160N, R93W, Sec. 36), 60 acres in size, is about 5 miles north of the community of Power Lake. It is the only "patterned peatland" in North Dakota with string and flark formation (Duxbury and Heidel 1986).

Specimens were identified using taxonomic keys and species descriptions in Crum and Anderson (1981) and Lawton (1971). Taxonomic nomenclature follows Anderson et al (1990). D.H. Vitt, University of Alberta, Calgary, Alberta verified species, and specimens were deposited at that herbarium (ALTA) or at the herbarium at the Missouri Botanical Garden (MO). All of the species that I collected from North Dakota fens are included in this report.

Aulacomnium palustre (Hedw.) Schwaegr. Aulacomniaceae. Towner Fen, *Elliott 2035* (MO). Previously known from two records in southeastern North Dakota (W3 TROPICOS Data Base, Churchill 1999).

Bryum pseudotriquetrum (Hedw.) Gaertn. et al. Bryaceace. Towner Fen, *Elliott 2039* (ALTA,verif. D. Vitt); Smishek Lake Fen, *Elliott 1980* (MO); and Denbeigh Fen, *Elliott 1983* (ALTA, verif. D. Vitt). This species has also been reported from Dunn County (Ikenberry 1932) and Billings County in western North Dakota (Blaney and Norris 1987).

Calliergon giganteum (Schimp.) Kindb. Amblystegiaceae. Towner Fen, *Elliott 2038* (MO and ALTA, verif. D. Vitt). New to North Dakota. This species grows in fens and other wetlands, has a broad tolerance for pH values, and is common and widespread at northern latitudes (Crum and Anderson 1981).

Campylium stellatum (Hedw.) C. Jens. Amblystegiaceae. Smishek Lake Fen, *Elliott 1972* (MO); Denbeigh Fen, *Elliott 1981* (ALTA, verif. D. Vitt). New to North Dakota. This species is a dominant component of extreme rich fens (Vitt et al 1988).

Cratoneuron filicinum (Hedw.) Spruce. Amblystegiaceae. Denbeigh Fen, *Elliott 2046* (MO). Smishek Lake Fen, *Elliott 1979* (MO and ALTA) There are four records of this species in North Dakota (Ikenberry 1932 and W3 TROPICOS Data Base, Churchill 1999). In western North America, this species is common on periodically inundated, calcareous rocks and around calcareous seeps (Vitt et al 1988).

Hamatocaulis vernicosus (Mitt.)Hedenas. Amblystegiaceae. Smishek Lake Fen, *Elliott 1977* (MO and ALTA, verif. D. Vitt) and Towner Fen, *Elliott 2037* (MO). New to North Dakota. Often occurs at the edges of pools in rich fens, but not submerged (Crum and Anderson 1981). Janssens (1983) reported that this species is circumboreal. Its distribution includes northern Minnesota, Montana and southern Saskatchewan, near the fen locations I visited in western North Dakota.

Helodium blandowii (Web.&Mohr) Warnst. Helodiaceae. Towner Fen, *Elliott 2033*

(MO and ALTA, verif. D. Vitt). Known from one previous record in extreme southeastern North Dakota (Ikenberry 1932). This moss occurs exclusively in minerotrophic peatlands (Vitt et al 1988), often under a canopy of trees or shrubs (Crum and Anderson 1981).

Leptodictyum riparium (Hedw.)Wanst. Amblystegiaceae. Towner Fen, *Elliott 2040* (ALTA, verif. D. Vitt). Previously reported from Billings County, western North Dakota, by Bilderback (1987). He found this species at several locations in drainages shaded by Rocky Mountain juniper.

Limprichtia revolvens (Sw.) Loeske. Amblystegiaceae. Denbeigh Fen, *Elliott 1984* and *2047* (MO and ALTA, verif. D. Vitt). New to North Dakota. Occurs in poor fens and the more oligotrophic habitats of rich fens (Crum and Anderson 1981). This species is circumboreal and a conspicuous element in rich fens (Janssens 1983). Its distribution includes Montana, Minnesota, and Colorado (Janssens 1983).

Meesia triquetra (Richt.) Angstr. Meesiaceae. Denbeigh Fen, *Elliott 1982* (MO and ALTA, verif. D. Vitt). New to North Dakota. Montagnes (1990) reported that this species is a rich fen indicator of high fidelity and shows its distribution to include western Montana, northern Minnesota, and central Saskatchewan. Her distribution map indicates that there are no records for the Great Plains.

Plagiomnium ellipticum (Brid.) T. Kop. Mniaceae. Denbeigh Fen, *Elliott 2045* (MO and ALTA, verif. D. Vitt) and Towner Fen, *Elliott 2036* (MO). The W3 TROPICOS Data Base (Churchill 1999), indicates that there are three previous records for this species from eastern North Dakota.

Tomentypnum nitens (Hedw.) Loeske. Brachytheciaceae. Towner Fen, *Elliott 2034* (MO and ALTA, verif. D. Vitt). Ikenberry (1932) reported this species from one location in southeastern North Dakota.

Acknowledgments. I thank Dale Vitt for identifying specimens and Bonnie Heidel, formerly of the North Dakota Natural Heritage Program and currently of the Montana Natural Heritage Program, for providing maps and element occurrence records for North Dakota fens. I thank the Kongslie family of Towner, North Dakota for permitting access and collecting in Denbeigh Fen.

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Rare and Unusual Liverworts in Western Massachusetts

Susan A. Williams

Over the past two years I have collected four species of unusual liverworts rare in the northern states. All are more common in the south and are infrequent, local and rare in the north being at the northern edge of their range.

Frullania plana Sull. (#395). I found this liverwort in Rowe, MA (Franklin Co.) in an area known for its soapstone. It was growing on a near vertical ledge in deciduous woods. It's aspect was similar to *Porella platyphylla* growing in loose, shelf-like clumps.

According to Schuster (1969) *Frullania plana* is known to be "consistently saxicolous and preferring shaded to partially shaded dry ledges and boulders in deciduous woods." It appears to prefer substrates that are non-acidic and is found mainly at elevations above 1000 ft. All these characteristics correspond exactly to the habitat where I found it growing except that the elevation was about 800 ft. *Frullania plana* is an "Appalachian endemic, often local in range, restricted to deciduous forest associations. It is found predominantly in the Appalachian Mts., south of the glacial boundary, but penetrating slightly to the north into New York, Connecticut and Massachusetts where it is very rare and local" (Schuster, 1969). This collection appears to be the new northernmost station with the previous one on the eastern side of Mt. Toby in Leverett, MA.

Cephaloziella spinicaulis Douin (#396). This tiny liverwort was also found growing at the soapstone area in Rowe, MA (Franklin Co.). It was growing in small patches on a dry boulder in shaded deciduous woods.

I didn't realize the treasure I had found until I put it under the microscope and saw that both the leaves and stems were very papillose which keyed out quite easily to *C. spinicaulis*. According to Hicks (1992), *Cephaloziella spinicaulis* occurs in "scattered locations from Connecticut south in the Appalachian Mts. to Tennessee and North Carolina". Schuster (1969) indicates that it is "very rare in eastern North America and restricted to the Appalachian system." In the south it is found at elevations between 2000 and 5000 ft, but further northwards it is found at lower elevations. The station at Hartford, Connecticut was at 750 ft. and my own find was at about 800 ft. It is very small and inconspicuous and as Schuster says, "probably more common than reports would suggest".

Plagiochila austini Evans (#475). I found this tiny liverwort along the Fife Brook in Florida, MA (Berkshire Co.). It was growing on a damp, vertical ledge near the brook and was mixed in with other bryophytes. The Fife brook ravine is very steep and deeply shaded.

Plagiochila austini has an Appalachian distribution and rarely occurs below 3000 ft. although this particular collection was made at 900 ft. Schuster says it prefers "rich, moist, densely forested ravines growing on humid or damp (not wet) rock walls" – exactly the location

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where I found it. Schuster further explains that "*Plagiochila austini* is the only other *Plagiochila* (other than *P. asplenioides*) that has been able to extend its range northward into the region that suffered pleistocene glaciation. It is so rare and sporadic in New England that one must assume that isolated, viable caducous leaves have been blown north from populations below the zone of glaciation." It has previously been collected in Chesterfield Gorge, MA (Hampshire Co.). Two stations are also recorded from Vermont, one in the Champlain lowlands and the other from the Green Mts. (McQueen, 1992).

Radula obconica Sull. (#484). This liverwort is somewhat more common than the other three species I collected in that it occurs from Quebec to Florida, but according to Schuster (1969) it is "infrequent to rare northward with Massachusetts on the northern fringe of it's range."

I found this liverwort growing on a vertical surface of a dry boulder along Reed Brook in Florida, MA (Berkshire Co.). It was partially shaded, but the area received extensive windfall damage in July 1997 due to a tornado and now much of the lower river gorge is quite open and very inaccessible due to a tangle of fallen trees. Schuster says that *Radula obconica* is a pioneer plant that prefers the vertical faces of damp, non-calcareous boulders often along streams in gorges.

It has previously been collected in Sheffield, MA (Berkshire Co.), Conway, MA (Franklin Co.) (Schuster, 1969) and from the Champlain lowlands of Vermont (McQueen, 1992).

All numbers are my own collection numbers and voucher specimens have been deposited in the herbarium at the New York State Museum at Albany, New York.

Acknowledgements: I wish to thank Norton Miller for verification of the specimens.

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Bryonora rhypariza (Nyl.) Poelt – new to North America.

Alan M. Fryday

In the process of reorganizing the lichen collection at Michigan State University Herbarium (MSC) it was discovered that all the specimens referred to *Halecania alpivaga* (Th. Fr.) M. Mayrh.) were growing over bryophytes in terricolous habitats. As this species is strictly saxicolous, or grows over other lichen, there was obviously something wrong. A cursory examination revealed that all the specimens collected from the Western USA had large flat brown apothecia lacking a thalline margin and were referable to *Bryonora.* Closer examination showed most of them to be *B. pruinosa* (Th. Fr.) Holt.-Hartw., with one specimen from Colorado belonging to *B. castanea* (Hepp) Poelt.

However, a collection made from Baffin Island by Mason Hale in 1950 (cf. Thomson 1997), and identified as *Lecania alpivaga* by A. Magnusson, and two specimens from Sweden (one also determined by Magnusson), had a much thicker thallus and apothecia with a thick, granular, grey thalline margin. Microscopic examination of these specimens revealed that these too were referable to *Bryonora* and in morphology, anatomy and chemistry matched the description of *B. rhypariza* (Nyl.) Poelt. Swedish lichenologists are known to have confused *Halecania apivaga* and *Bryonora rhypariza* in the past (e.g. Malme, c.f. Poelt 1983, Mayrhofer 1987) and it appears that this confusion was transferred to N. America via Magnusson' s erroneous determination of Hale's collection. The identity of the specimens was confirmed by comparison with the illustration in Poelt (1983) and the discovery of several apothecia of the lichenicolous fungus *Dactylospora rhyparizae* Arnold on the apothecia of one of the Swedish specimens.

Bryonora rhypariza is reported for the first time from North America. As there appears to be no good descriptions of this species in English one is provided here.

Materials and Methods: The thallus and apothecial characteristics were examined on hand-cut sections by light microscope mounted in water and 10% KOH. The ascus structure was studied in 0.5% Lugol's solution after pretreatment with 10% KOH.

Bryonora rhypariza (Nyl.) Poelt

Lecanora rhypariza Nyl., Novitiae quaedum Licheneae norvegicea. – Öfvers. K. Vet. Akad. Förh. **1860(6):** 295-297, (1860).

Herbarium, Dept Botany & Plant Pathology, Michigan State Univ., East Lansing, MI 48824.

N. America: Baffin Island, head of Clyde Fiord. c. 70°N 70°W, on soil in bed rock cracks, often inundated, 11 July 1950, *M. E. Hale Jr.* 681 (MSC, CANL).

Thallus well developed, composed of grey to pinkish-brown, ±grey pruinose, granular to sub-squamulose areoles to 1.0mm diam., coalescing to form small thalli to 1cm across; cortical cells olivaceous-brown in section. Growing over a cyanobacterium (*Stigonema*) mat. *Photobiont* chlorococcoid, cells (9)12-15(-18)µm diam. *Apothecia* arising from the centre of the areoles, abundant often ±obscuring the thallus; flat, larger apothecia becoming flexuose; disc mid- to dark brown, lecanorine, with thick, persistent thalline margin 0.06-0.1mm wide, concolorous with the thallus. *Hymenium* hyaline, I+ blue, 85-100µm tall; epihymenium brown, 8-12µm wide. *Paraphyses* 1.5-2.0µm thick swelling at apex to 5.0µm, with brown pigmented cap; simple, strongly conglutinated. *Asci* clavate-cylindrical, c. 60-85 x 15-20µm, walls I+ blue, with a distinctly I+ blue tholus, ?*Lecanora*-type. *Ascospores* hyaline, 8/ascus, simple to 1-septate, elongate-ellipsoid (19.0)24.0-26.0 x 5.0-7.0µm. *Hypothecium* hyaline, composed of randomly arranged hyphae, merging into the horizontally arranged hyphae of the excipulum which extends below the hypothecium, base root-like. *Proper excipulum* poorly developed laterally. *Conidiomata* not seen.

Chemistry: Thallus C-, K+ red, Pd+ yellow, norstictic and connonstictic acids by TLC.

Bryonora rhypariza is elsewhere known from the Nepal and Central and Northern Europe, including Iceland (Poelt 1983). The N. American specimen agrees well with var. *rhypariza*. .Two other varieties have been recorded only from Nepal; var. *lamaina* Poelt, which has larger ascospores, and var. *cyanotropha* Poelt & H. Mayrh., which forms an intimate relationship with a cyanobacterium (*Stigonema*). Species Associated with the N. American specimen include *Psora rubiformis* (Ach.) Hooker, *Candelariella terrigena* Räsänen and *Collema* sp.

Additional specimens examined. **Sweden:** Jämtland, Storlien, Stenfjället och bergen nordväst om Skurdalshöjden, 1914, *E. P. Vrang* (MSC); Torne Lappmark, Karesuando sn, Peld saområdet, Gåbnetjåkko, N-branten, hammaren, bland mossa, reg. alp., 28 July 1948, *T.E. Hasselrot* (MSC).

Acknowledgements: The National Science Foundation is thanked for financial assistance for Award No. DBI-9808735 (Alan Prather, PI) to Michigan State University that allowed the author access to the lichen herbarium at MSC.

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The Moss Exchange

Bruce Allen (Missouri Botanical Garden, P.O. Box 299, St. Louis, MO 63166-0299) is now Director of the *American Bryological Lichenological Society's Moss Exchange*.

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Using the Ascus Apex in Lichen Identification

John W. Thomson

In lichenology some ideas and approaches are slow to be accepted and used, such as the familiar case of the use of microchemistry in lichen taxonomy. Another approach, using the structure of the ascus tip has appeared on the scene and is now being used to aid in identification especially of the difficult and small crustose genera. The reaction of the ascus tip with iodine can be of help in delimiting the genera but is not yet readily used in North America, perhaps because the studies are not readily available to the students in our continent. With this in mind I will summarize of the method. The methology is thoroughly detailed in Malcolm & Galloway, 1997, New Zealand Lichens. Other useful studies include Baral, 1987, Hafellner 1984, Hertel 1984, and Purvis et al, 1992.

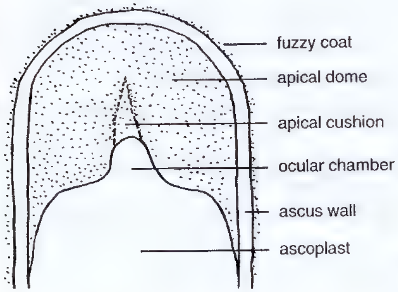

Figure 1 illustrates the structure of a "*Bacidia*-type" ascus structure.

To test, make the usual hand section of the apothecium as thin as you can manage with a single edged razor blade. You may need to glue the apothecium to a bit of paper with Duco cement to hold it more firmly when sectioning. The sections should then be treated with 10% KOH solution to clear them. Then carefully remove the KOH solution and replace it with iodine solution. Galloway recommends 30% Lugol's iodine solution (0.5 g iodine crystals, 1.5 g KI, in 100 ml distilled water). If the reaction is too strong then drain off the iodine solution and replace with water. As the asci are in various stages of ripening or readying for duscharge, you may often have some difficulty in finding just the right stage of development and have to search over the section.

Figure 1 details the nomenclature used for Figure 2. There may be an outer "fuzzy-coat" layer over the ascus wall. Within is an apical dome into which projects an apical cushion from the ocular chamber. The latter is a projection of the ascoplast up into the apical dome.

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Figure 2 illustrates the ascus tips in various genera of crustose lichens, as follows:

1. In *Amygdalaria*, *Clauzadea*, *Farnoldia*, and *Porpidia* there is an axial mass surrounded by an apical dome or tholus with an inner dark blue reaction.
2. In *Adelolecia*, *Bacidia*, *Lecania* and *Tephromela* add a slight ocular chamber to the above.
3. In *Bacidia*, *Buellia*, *Carbonea*, *Cetraria*, and *Lecanora* there is an ocular chamber, an apical cushion, and an apical dome.
4. In *Lecidea* there is an apical dome with darkenede tip and a small ocular chamber.
5. *Fuscidea* has darkening to the outer and inner parts of the apical dome.
6. *Saccomorpha* has no staining of the apical dome.
7. *Schaereria* lacks any apical dome or staining.
8. *Biatora* had a complicated apical dome with an ocular chamber, apical cushion, and darkenede apical dome.
9. In *Catillaria* you should find only an uncomplicated darkened apical dome.
10. In *Candelaria* and *Candelariella* the inner, lower part of the apical dome stains heavily and more faintly where the ocular chamber would be.
11. *Rhizocarpon* has a darkening of the outer apical part of the apical dome.
12. *Tremolecia* lacks staining of the ascus apex.
13. In *Anisomeridium* and *Aspicilia* there is only a suggestion of an ocular chamber.
14. *Thrombium* lacks apical dome but the tip of the ascus wall stains more than the sides.
15. In *Nephroma*, *Peltigera* and *Placynthium* the apical dome is stained and its tip more deeply, plus a staining where the ocular chamber would be present.
16. *Rimularia* has a small apical dome with the sides and center staining more darky than the rest.
17. *Arthonia*, *Arthothelium*, *Tremolecia* and *Aspicilia* have no staining of the apical dome but Hafellner suggests an ocular chamber could be present.
18. *Caloplaca*, *Teloschistes* and *Xanthoria* have a slight thickening of the apical wall with a darkening of the apex.
19. *Opegrapha* shows an unstaining apical dome with an ocular chamber.
20. *Acrocordia* should show the inner part of the apical dome staining heavily over a broadened ocular chamber.

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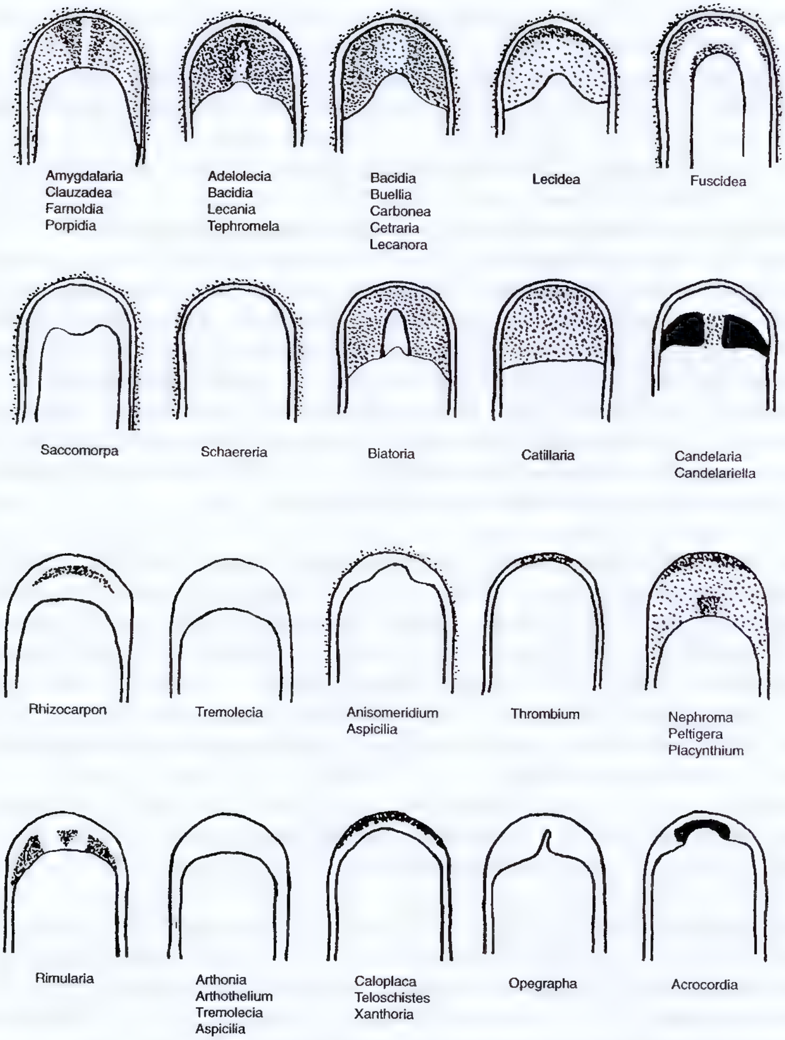

Figure 2. Ascus tips in various genera of crustose lichens

Bryoerythrophyllum, *Gymnostomum*, and *Hymenostylium* (Musci: Pottiaceae) in Maine

Bruce Allen

The Pottiaceae are a large and exceedingly complex family of worldwide distribution. Members of the family usually grow on soil or rock, especially on calcareous substrates, in dry places. Due to its large size and tremendous variability the family is difficult to characterize. In a broad sense, gametophytes in the Pottiaceae are usually small, have contorted leaves, with entire or dentate margins, and leaf cells that are short, pluripapillose above but enlarged, hyaline and smooth below. The costa in the Pottiaceae is always single and well-developed. Features of its internal structure, as well as the internal structure of the stem, are important in the taxonomy of the family. Proper identification of Pottiaceae genera and species requires the making of leaf and stem cross-sections. Sporophytically, the family usually has elongated, twisted setae, erect-cylindrical capsules, and 16–32 filiform peristome teeth that are borne on a basal membrane. When the family is considered on a worldwide basis, however, the species seem to exhibit every conceivable variation and combination of variations in gametophytic and sporophytic features.

There have been many attempts at subdividing this complex family and these varying classifications are sometimes radically different in their disposition of genera. Due to the reticulating nature of character variation in the Pottiaceae these classifications rely upon a subjective weighting of the various features of the group. For example, the genus *Weissia* is often aligned with *Trichostomum* (Crum & Anderson 1981, Saito 1975) when the features of leaf shape, a costa with two stereid bands and the presence in some *Trichostomum* species of involute leaf margins are emphasized. Zander (1993), however, recently placed the genus in a group nomenclaturally centered around *Hyophila* by emphasizing the involute leaf margins of *Weissia* and the presence in a few *Weissia* species of leaf cells that are ventrally bulging but dorsally flat.

Regional treatments of the Pottiaceae that can be usefully applied to the family in Maine have been published for Japan (Saito 1975), eastern North America (Crum & Anderson 1981), Maritime Canada (Ireland 1982), and Mexico (Sharp *et al.* 1994). Zander's (1993) monumental generic treatment of the family is an essential work for those attempting to understand this complex family.

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There are only 15 species of Pottiaceae in Maine and these are distributed in 9 genera. This low species number is due in part to a lack of extensive calcareous habitats in Maine, but a careful search of the limestone regions in Maine will surely find more Pottiaceae species new to the state. Nine of the Maine genera have a single species, and the remaining 3 genera have only 2 species. As a result much of the reticulating variation found within the genera, when they are considered on a world-wide basis, is absent.

Bryoerythrophyllum Chen, Hedwigia 80: 4. 1941.

Plants small- to medium-sized, in tufts, green above, distinctly red to reddish-brown below. Stems in cross-section with hylodermis absent, central strand present, irregularly branched, sparsely radiculose. Leaves erect, usually sheathing at base, twisted, appressed-incurved when dry, erect-spreading to spreading when wet, lingulate, ovate, ovate-triangular, ovate-lanceolate, oblong-lanceolate, lanceolate, concave, acute to obtuse; margins recurved below, plane or recurved above, entire or irregularly dentate above, bordered or unbordered; costa subpercurrent, percurrent or excurrent as a sharp, smooth apiculus, in cross-section with median guide cells, ventral and dorsal stereid bands, ventral epidermal layer usually differentiated; upper cells firm-walled, oblate to irregularly quadrate or rounded-hexagonal, pluripapillose by thick, c-shaped papillae; basal cells quadrate, short- or long-rectangular, smooth or papillose, thick- or thin-walled, alar cells not differentiated. Perichaetial leaves sheathing. Dioicous, synoicous, or paroicous. Inflorescences terminal. Setae elongate. Capsules cylindric; opercula short-conic to short-rostrate, annulus usually well-developed; peristome variable: none, rudimentary, or with 16 or 32 filiform teeth that are usually short and erect but sometimes long and spirally twisted teeth, basal membrane present or absent. Calyptrae cucullate, smooth.

Bryoerythrophyllum is a genus of 28 species (Crosby et al. 1999). Although there are a few widely distributed species, the centers of distribution for the genus seems to be in Asia and Latin America. *Bryoerythrophyllum* is distinguished by its distinctive, strong-red coloration, massive c-shaped papillae on the upper leaf cells and on the ventral surface of the costa, usually well-differentiated leaf bases, and a costa in cross-section that has two well-developed stereid bands as well as enlarged, ventral epidermal cells. Species of *Bryoerythrophyllum* often have dentate upper leaf margins, and although most species have short, erect peristome teeth, in some species the peristome is absent, rudimentary, or consists of long, spirally twisted teeth. The genus is similar to *Didymodon* or *Barbula,* indeed it is sometimes included within a broadly conceived *Barbula* (Smith 1978, Nyholm 1990). Zander (1993) distinguished it from *Barbula* by the combination of its reddish coloration, massive, crowded leaf papillae, and well-differentiated leaf bases.

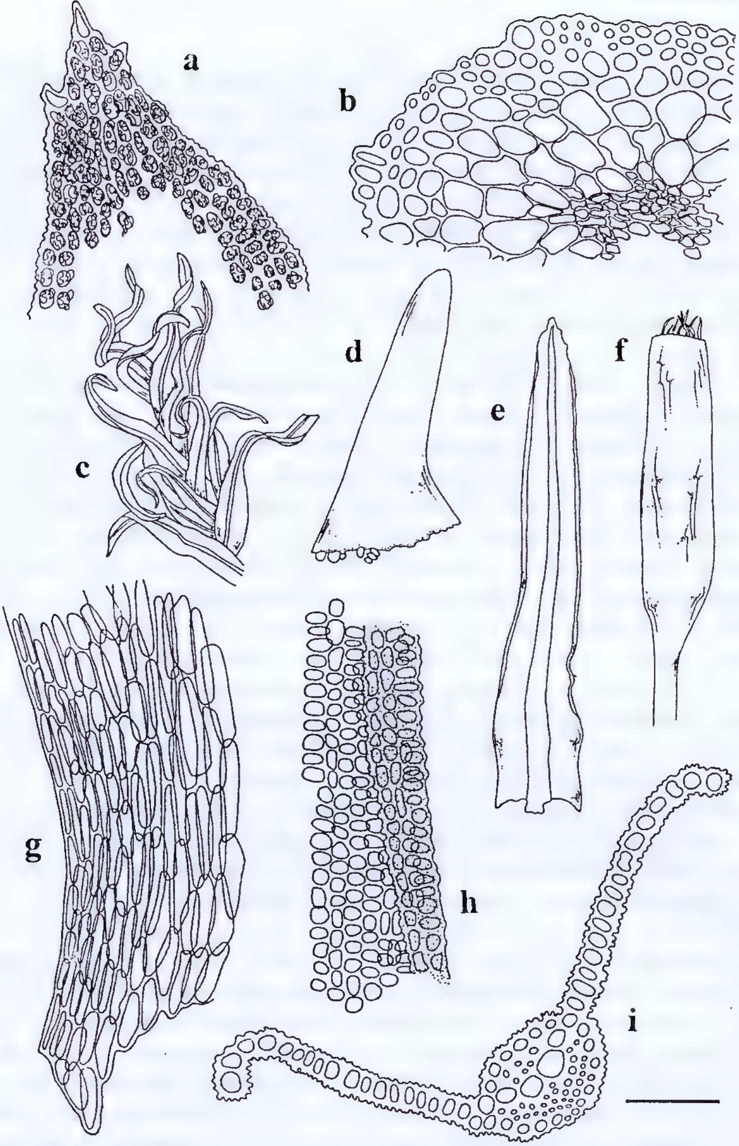

Figure 1. *Bryoerythrophyllum recurvirostrum*. a. Leaf apex. b. Stem cross-section. c. Habit. d. Operculum with remnants of annulus at base. e. Leaf. f. Capsule. g. Basal cells in alar region. h. Median leaf cells at margin. i. Costa cross-section. Scale bar in mm: bar = 0.05 (a,b,g–i); bar = 0.2 (d); bar = 0.5 (f); bar = 0.71 (e); bar = 1.13 (c). Figures a,c,e–i from *Allen 14688* (MO), figure b from *Standley 67665* (F), figure d from *Williams et al. 41071B* (MO).

The Latin American genera *Mironia* and *Rhexophyllum* are closely related to *Bryoerythrophyllum*. They differ from it essentially in having keeled leaves that are bistratose either at the margins (*Mironia*) or irregularly throughout the leaf lamina (*Rhexophyllum*). *Rhexophyllum* also differs from *Bryoerythrophyllum* in having a stem hylodermis. The distinctions between these genera are blurred by the presence in *Bryoerythrophyllum* of a Mexican species (*B. sharpii* Zand.) that consistently has bistratose upper leaf cells as well as at least one species (*e.g., B. ferruginascens* (Stirt.) Giac.) that occasionally has bistratose patches in the upper parts of the leaves.

The name *Bryoerythrophyllum* combines the Greek *bryo-* (relating to mosses), *erythro-* (red) and *phyll-* (relating to leaves) in reference to the distinctive reddish color of its leaves.

Bryoerythrophyllum recurvirostrum (Hedw.) Chen, Hedwigia 80: 5. 1941.

Weissia recurvirostra Hedw., Sp. Musc. Frond. 71. 1801. *Didymodon recurvirostrus* (Hedw.) Jenn. Man. Mosses W. Pennsylvania 96. 1913. *Barbula recurvirostra* (Hedw.) Dix., Rev. Bryol. Lichénol. 6: 991. 1934.

Plants medium-sized, reddish-green to reddish-yellow, 5–25 mm high. Stems red, erect, irregularly branched, rhizoids red, smooth, stems in cross-section with hyalodermis absent, central strand well-developed. Leaves 2–3 mm long, erect-sheathing at base, erect-twisted and incurved when dry, erect-spreading to spreading when wet, oblong-lanceolate to lanceolate, bluntly acute, apiculate; margins unistratose, recurved in the lower 3/4 or to the apex, irregularly dentate above, not bordered, decurrent at base; costa subpercurrent to percurrent, papillose at back, ventral superficial cells short-rectangular to quadrate, pluripapillose, in cross-section with median guide cells, ventral and dorsal stereid bands well-developed, ventral epidermal layer enlarged, densely papillose, dorsal epidermal layer enlarged, papillose; upper cells 8–12 µm x 8–12 µm, firm-walled, oblate to irregularly quadrate, densely pluripapillose by thick, c-shaped papillae; basal cells smooth, hyaline, enlarged, thin-walled and bulging, long-rectangular 30–90 µm x 8–18 µm, alar cells not differentiated. Synoicous or paroicous. Perichaetia terminal; perichaetial leaves elongate, sheathing. Setae smooth, 10–15 mm long, red. Capsules cylindric, erect and symmetric, 2–3 mm long, smooth, suboral ring differentiated in 1–2 rows; stomata present in neck; opercula obliquely short-rostrate, 0.5–0.8 mm long; exothecial cells rectangular; annulus revoluble to deciduous, of 1–3 rows of vesiculose cells; peristome of 16 erect, light-yellow to hyaline, filamentous, irregularly cleft, lightly papillose teeth, to 240 µm long, basal membrane low to absent. Spores 14–16 µm, smooth to slightly papillose. Calyptrae cucullate, smooth, 1.5–2.0 mm long. n = 13 (Fritsch 1991).

On humus or soil over rock (limestone), soil over relic shell heap, and at base of *Thuja*. In Maine known from Androscoggin (*Allen 14688* MO), Aroostook (*Allen 16379* MO), Lincoln (*Allen 20008* MO), Oxford (*Allen 21058* MO), Penobscot (*Duncan* NY); Piscataquis (*Porter* MO), and Somerset (*Allen 9275C* MO) Counties.

Bryoerythrophyllum recurvirostrum is found throughout the Northern Hemisphere (including Hawaii). It also occurs in both the Neotropics (Central America to northern South America) and Paleotropics (Africa and Malesia) as well as in South Temperate regions (Falkland Islands and Australia-New Zealand). The species is marked by its oblong-lanceolate to lanceolate leaves that have strongly recurved leaf margins, rectangular basal cells, and irregularly dentate leaf apices. It is generally associated with (but not restricted to) calcareous habitats, and tends to be a weedy species, e.g., often found on or near concrete bridge abutments. It is always a pleasure to collect this species because sporophytes are often present due to its synoicous or paroicous sexuality condition and the gametophytes can be recognize in the field by the brick-red color of its lower leaves. Microscopically, the presence of irregularly dentate leaf apices and densely papillose leaf cells are distinctive features of the species.

Gymnostomum Nees & Hornsch., Bryol. Germ. 1: 112. 1823, *nom. cons.*
Gymnostomum Hedw., 1801, *nom. rejic.*

Plants small- to medium-sized, light- to dark-green above, brown below, often crusted with calcareous deposits, in tufts or cushions. Stems erect, sparsely and irregularly branched, in cross-section sclerodermis present or absent, hyalodermis present or absent, central strand present; rhizoids dimorphic: slender, red, smooth, branched ones scattered on the stem and massive, red, roughened, sparsely branched ones originating in leaf axils. Leaves ligulate to linear-lanceolate, plane or weakly concave above, wide-spreading when wet, appressed when dry, apex contorted, apices acute to obtuse or sometimes rounded, margins plane, entire to crenulate. Costae ending below apex, narrow, dorsal surface papillose, ventral surface papillose, in cross-section oval, ventral stereid band present or absent, dorsal stereid band present, ventral surface cells enlarged, dorsal surface cells smaller than laminal cells and strongly thickened. Laminal cells weakly heterogeneous, rounded to quadrate sometimes transversely rectangular, papillose by simple, low papillae; basal cells homogeneous, short-rectangular, smooth. Asexually reproducing by gemmae in leaf axils. Dioicous. Perigonia and perichaetia terminal. Setae elongate. Capsules exserted, erect, short-cylindrical. Peristome absent. Opercula rostrate. Calyptrae cucullate.

Gymnostomum, a genus of 20 species (Crosby *et al.* 1999), is found on rocks, boulders and cliff faces usually in wet or seepy places. It is generally associated with calcareous habitats but also occurs occasionally on acidic rocks. The genus usually is soft-green in color, has lanceolate leaves with plane leaf margins that are roughened papillose above and at times serrulate below. Its stem has a central strand and at times a weakly developed hylodermis is present. The leaf cells in *Gymnostomum* are firm-walled throughout and are ornamented by simple, low, scattered papillae. Although most members of *Gymnostomum* have two stereid bands in the costa, the only Maine species, *G. aeruginosum*, sometimes has only a single (dorsal) stereid band. The perigonia and perichaetia are terminal in *Gymnostomum* and its capsules are eperistomate.

Zander (1993) considered *Gymnostomum* a reduced, hydrophilic segregate of *Barbula*. The genus however is often associated with *Hymenostylium recurvirostrum*. Zander (1993) puts *Gymnostomum* and *Hymenostylium* in different tribes on the basis of whether or not a stem central strand is present. Some forms of *Molendoa*, a genus not yet known from Maine but likely to occur there, can be difficult to distinguish from *Gymnostomum*. Usually the two genera can be distinguished by the percurrent to excurrent costa, massive leaf papillae and lateral perichaetia of *Molendoa*.

The name *Gymnostomum* combines the Greek *gymno-* (naked) and *stoma* (mouth, opening) in reference to its eperistomate capsules.

Gymnostomum aeruginosum Sm., Fl. Brit. 3: 1163. 1804.

Trichostomum aeruginosum (Sm.) Lindb., Öefv. Förh. Kongl. Svenska Vetensk.-Akad. 21: 229. 1864. *Mollia aeruginosa* (Sm.) Lindb., Musci Scand. 106. 1879. *Eucladium aeruginosum* (Sm.) C. Jens., Danmarks Mosser 2: 313. 1923.

Plants small and slender to medium-sized, forming tufts or caespitose, yellowish-green to pale-green, saxicolous or terricolous. Stems 2–20 mm long, smooth, branching irregularly, in cross-section round, central strand usually present, inner cortical cells thin-walled, uniform throughout, outer cortical cells thin- or weakly thick-walled, smaller than inner cortical cells, yellowish-green to reddish-brown, in 1–2 rows; rhizoids dimorphic: slender, red, smooth, branched ones scattered on the stem and massive, red, roughened, sparsely branched ones originating in leaf axils. Leaves somewhat distant and evenly spaced, wide-spreading when wet, appressed when dry, apex contorted, ligulate to linear-lanceolate, 0.6–1.0 mm long, apices acute to obtuse or sometimes rounded, margins plane, entire to crenulate. Costae ending just below apex, narrow, dorsal and ventral surfaces papillose, in cross-section oval, ventral stereid band weakly developed, at times absent, dorsal stereid band present, ventral surface cells enlarged, dorsal surface cells smaller than laminal cells and strongly thickened. Upper leaf cells somewhat heterogeneous, rounded to quadrate sometimes

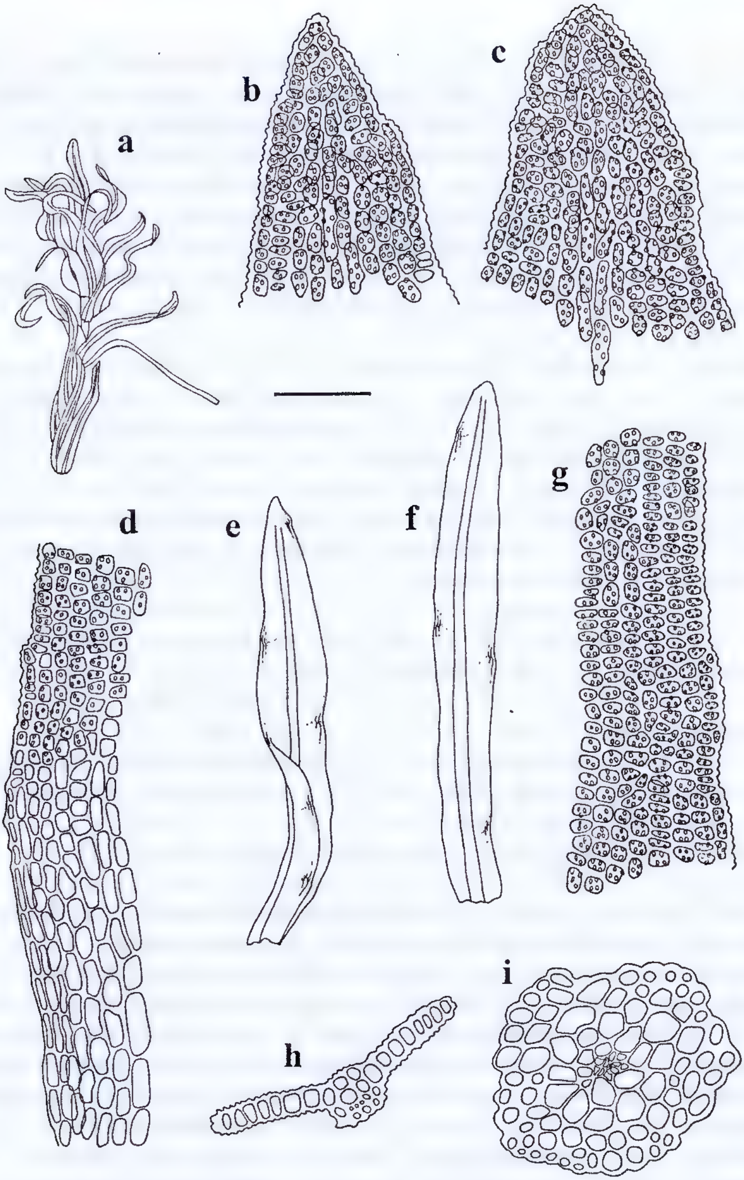

Figure 2. *Gymnostomum aeruginosum*. a. Habit. b. & c. Leaf apices. d. Leaf cells at base. e. & f. Leaves. g. Median leaf cells at margin. h. Leaf cross-section. i. Stem cross-section. Scale bar in mm: bar = 0.05 (b–d, g–i); bar = 0.28 (e & f); bar = 1.42 (a). All figures from *Allen 21054* (MO).

transversely rectangular, 8–10 µm long, 1:1–2 (length:width), walls weakly thickened, papillose on both surfaces by scattered, low papillae; basal cells homogeneous, short- rectangular, 2–3:1 (length:width), thin-walled, smooth; marginal cells not differentiated; alar cells not differentiated. Asexually reproducing by gemmae in leaf axils. Dioicous. Perigonia terminal, geminate. Perichaetia terminal. Setae 4–6 mm long, yellow, smooth. Capsules exserted, erect, short-cylindrical, 0.5–0.8 mm long, smooth, brown, stomata present in neck. Peristome absent. Opercula rostrate, beak erect, 0.5 mm long. Calyptrae cucullate, 0.7–1.0 mm long, smooth. Spores 9–12 µm, round, granulate, brown. n = 13 (Fritsch 1991).

On thin soil in seeping or dry, calcareous or acidic rock crevices and ledges. In Maine known from Oxford (*Allen 21054* DUKE, MAINE, MO, NY, US) and Somerset (*Allen 9312A* MO) Counties.

Gymnostomum aeruginosum, a small plant with a pale-greenish color, is found throughout North America. Distinctive features of the species include its stem central strand, narrowly lanceolate leaves with plane leaf margins, firm-walled upper and lower leaf cells that have simple, scattered papillae and subpercurrent costae that end 2–5 cells below the apex. The species often has obtuse leaves, although forms with acute leaves are also encountered. *Hymenostylium recurvirostrum* is sometimes placed in *Gymnostomum* (Crum & Anderson 1981, Ireland 1982) and it can be difficult to distinguish from *G. aeruginosum*. It differs from *G. aeruginosum* in lacking a stem central strand, having recurved lower leaf margins, often porose leaf cells, and systylius capsules.

Molendoa sendtneriana and *Anoectangium aestivum* can also be confused with *G. aeruginosum* and although these species are not presently known from Maine both may occur in the state. *Molendoa sendtneriana* is usually distinguished from *G. aeruginosum* by its more narrowly acute leaves that are weakly keeled above, and have more heterogeneous upper leaf cells with massive, fused papillae. There are, however, small, reduced plants of *Molendoa sendtneriana* with rounded leaves, more or less plane leaves, and low simple papillae that are very difficult to distinguish from *G. aeruginosum*. Plants of *G. aeruginosum* can be separated from this expression of *M. sendtneriana* by their less-developed ventral stereid band in the costa, more homogeneous upper leaf cells, terminal perichaetia, and the present of sparsely distributed, massive red rhizoids. *Anoectangium aestivum* is best distinguished from *G. aeruginosum* by its keeled leaves and deeply grooved costa that is only two cells wide at the ventral surface. Zander (1977) provided an in-depth treatment of *G. aeruginosum* and its relationships.

Hymenostylium Brid., Bryol. Univ. 2: 81. 1827.

Plants small- to medium-sized, yellow-green or green above, brown to reddish below, glossy, sometimes glaucous, in tufts or cushions. Stems erect, in cross-section sclerodermis present, hyalodermis absent, central strand absent; sparsely and irregularly branched; rhizoids moderately developed below. Leaves ligulate, lanceolate, or linear-lanceolate, keeled, erect at base, appressed-incurved above when dry, erect-spreading, spreading to squarrose when wet; acute to rounded; lamina unistratose; margins entire, at times crenulate above, plane above, broadly recurved along 1 or both sides below; costae excurrent, percurrent or subpercurrent, in cross-section median guide cells well-developed, ventral and dorsal stereid bands present, ventral surface layer not enlarged; upper cells subquadrate, oblate, to short-rectangular, firm-walled, often porose, pluripapillose, papillae low, simple, granular, not obscuring the cell lumen, centered or scattered; basal cells enlarged, rectangular, firm-walled, often porose, hyaline, smooth; alar cells not differentiated. Perichaetia and perigonia terminal, perichaetial leaves weakly differentiated. Setae elongate, smooth. Capsules ovoid, at times systylius; stomata present in neck; opercula erect-rostrate; annuli of 1–2 rows of weakly vesiculose cells; peristome absent. Calyptrae cucullate, smooth. Spores weakly papillose.

Hymenostylium, a genus of 16 species (Crosby *et al.* 1999), is found on limestone boulders and cliff faces or limey deposits in wet or seepy places. In Maine the genus has leaves with entire margins that are narrowly recurved at base on one or both sides and stems that have an outer sclerodermis but no central strand. The leaf cells of *Hymenostylium* are mostly firm-walled, often porose at the base and have simple papillae scattered over the lumens of the upper and median cells. In cross-section its costa has two stereid bands, but the ventral band is often weakly differentiated, and there is no enlarged layer of ventral epidermal cells. *Hymenostylium* has gymnostomous capsules and often systylius columellae. This last feature is only occasional to the genus and apparently not a constant feature of even *H. recurvirostrum* (Zander 1977).

Species of *Hymenostylium* are sometimes placed in the genus *Gymnostomum* (e.g., Crum & Anderson 1981, Ireland 1982). Zander (1993), however, considers *Hymenostylium* closer to *Leptodontium*. *Gymnostomum* differs from *Hymenostylium* in having a stem central strand, plane leaf margins, non-porose leaf cells, and non-systylius capsules.

The name *Hymenostylium* combines the Greek *hymen-* (membrane) and *stylos* (pillar or column) in reference to its systylius operculum.

Hymenostylium recurvirostrum (Hedw.) Dix., Rev. Bryol. Lichénol. 6: 96. 1934.
Gymnostomum recurvirostrum Hedw., Sp. Musc. Frond. 33. 1801.

Plants medium-sized, tufted or forming mats, yellowish-green to yellowish-brown, saxicolous or terricolous. Stems erect, 2–45 mm high, smooth, in cross-section central strand absent, inner cortical cells thin-walled, uniform throughout in 4–6 rows, outer cortical cells thick-walled, smaller than inner cortical cells, reddish-brown in 1–2 rows, hyalodermis absent; rhizoids red-brown, smooth to lightly roughened. Leaves distant and evenly spaced, lanceolate to oblong or ligulate, 1–3 mm long, appressed, somewhat contorted and incurved when dry, erect to wide-spreading when wet; apices acute to acuminate or obtuse, mucronate; margins generally plane above, weakly recurved on one side or both sides below, entire to crenulate; costae single, ending just below the apex, narrow, dorsal surface smooth, ventral surface smooth, round in cross-section, ventral and dorsal stereid bands present, ventral surface cells not enlarged; upper cells subquadrate to oblate above, becoming short-rectangular below mid-leaf, 8–20 µm x 8–14 µm, walls thickened to incrassate at times nodose, cells papillose, papillae low and centered over lumens; basal cells rectangular to oblong, 20–40 µm x 12–18 µm, walls somewhat thickened and pitted, smooth; alar cells not differentiated. Dioicous; perichaetia terminal, perichaetial leaves not strongly differentiated. Setae 4–10 mm long, reddish-brown, erect to sigmoid when dry. Capsules exserted, erect, short-cylindrical, 0.8–1.2 mm long, smooth, systylius, reddish-brown; stomata in neck; peristome absent; opercula rostrate, beak bent, 1 mm long. Calyptrae 1.5–2 mm, cucullate, smooth. Spores 12–18 µm, granulate, brown.

In crevices on bare, vertical rock faces. In Maine known from Oxford (*Adams 13612* MAINE), Piscataquis (*Porter* NY), and Somerset (*Allen 9312B* MO) Counties.

Hymenostylium recurvirostrum is a widespread species found throughout North America. It has much the same size, color, and aspect of *Gymnostomum aeruginosum* which is also gymnostomous. *Gymnostomum aeruginosum* differs from *H. recurvirostrum* in having a stem central strand, enlarged ventral epidermal cells on the costa, plane leaf margins, and non-porose leaf cells. *Anoectangium aestivum*, and *Molendoa sendtneriana*, two species not yet known from Maine, can be confused with *H. recurvirostrum*. Both species differ from *H. recurvirostrum* in having a stem central strand. *Anoectangium aestivum* further differs from *H. recurvirostrum* in having an apiculus ending in 1–3 clear cells, a deeply grooved costa that is only 2–3 cells wide on the ventral surface and has no

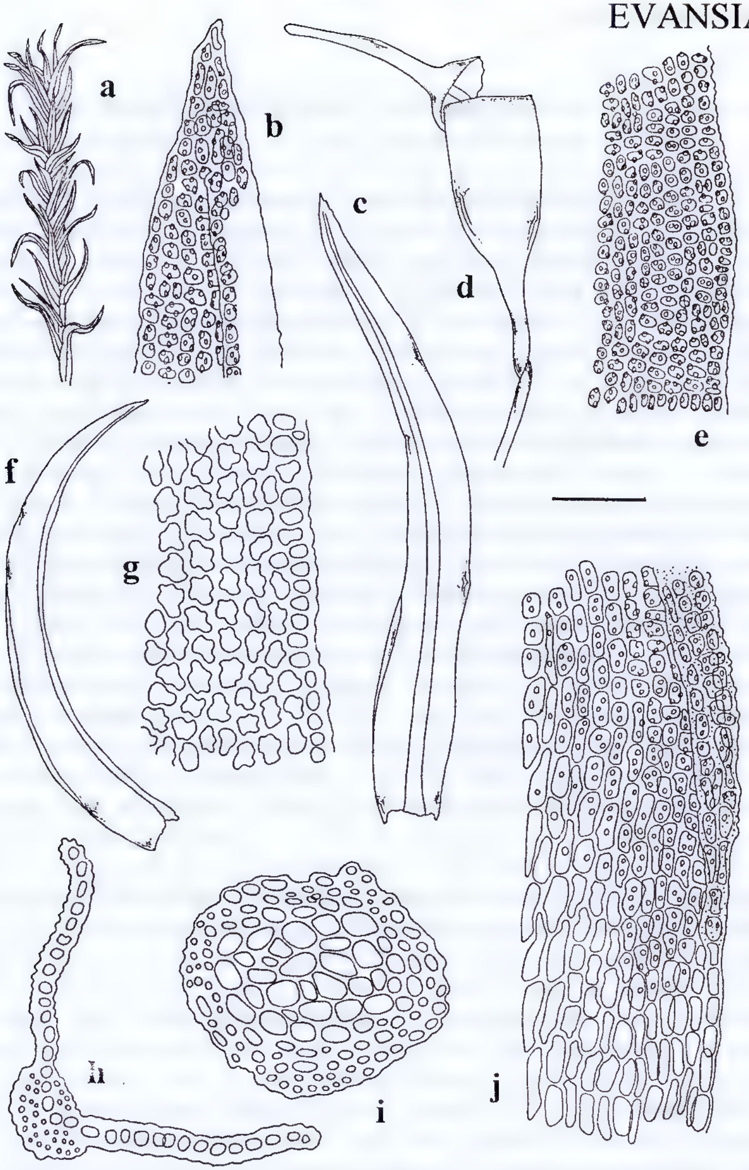

Figure 3. *Hymenostylium recurvirostrum*. a. Habit. b. Leaf apex. c. & f. Leaves. d. Capsule and operculum. e. Median leaf cells at margin, typical form. g. Median leaf cells at margin, collenchymatous form. h. Leaf cross-section. i. Stem cross-section. j. Basal leaf cells at margin. Scale bar in mm: bar = 0.05 (b,e,g–j); bar = 0.28 (c & f); bar = 0.5 (d); bar = 1.31 (a). Figures a–c, e, f, h–j from *Allen 18385* (MO), figure d from *Allen 16217* (MO), figure g from *Hermann 26324* (MO).

ventral stereid band, and non-porose leaf cells. *Molendoa sendtneriana* is similar to *H. recurvirostrum* in sometimes having porose leaf cells, but it also differs in having often massive, multiple papillae centered over the cell lumens. Zander (1977) provided an in-depth treatment of *H. recurvirostrum* and its relationships.

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Bryophytes from states of Illinois, Missouri, and Oklahoma: New County Records

Carl Darigo

This paper reports on 63 new moss and liverwort county records from Illinois, Missouri and Oklahoma. Most collections were made in the Interior Highlands region of North America. This region includes the southern portion of Missouri, much of Arkansas, a small section in southern Illinois and extends along the eastern border of Oklahoma.

The personal collections in this paper were made either during Botany Group outings of the Webster Groves Nature Study Society, or on private trips. Previously unpublished collections by Bruce Allen, Alan Brant, Jack Harris, Nels Holmberg, Stan Hudson and Bill Summers are also included in the paper.

New county moss records were distributed as follows:
ILLINOIS--Interior Highlands (3): *Ozark Hills*--3: Jackson-1, Randolph-2
MISSOURI--Interior Highlands (34): *Border*--3: St. Charles-2, Warren-1;
Mississippi Lowlands-7: Dunklin-7; *St. Francois Mountains*--2: Iron-1, Madison-1; *Salem Plateau*--22: Bollinger-8, Butler-1, Cape Girardeau-3, Douglas-5, Franklin-1, Ozark-1, St. Louis-1, Scott-1, Wayne-1
MISSOURI--Non-Interior Highlands (6): Atchison-1, Pike-5
OKLAHOMA--Non-Interior Highlands (2): Beckham-1, Roger Mills-1

New liverwort county records were distributed as follows:
ILLINOIS--Interior Highlands (3): *Ozark Hills*--3: Jackson-2, Union-1
MISSOURI--Interior Highlands (14): *Border*--2: St. Charles-1, Warren-1
Mississippi Lowlands--1: Dunklin-1; *Salem Plateau*--11: Bollinger-3, Douglas-1, Franklin-3, Howell-1, Ripley-1, Washington-1, Wayne-1
MISSOURI--Non-*Interior Highlands* (1): Pike-1

All specimens were verified by Bruce Allen or Alan Whittemore and are deposited at MO. Moss distribution comments were taken from Redfearn (1983). Basis for existing Interior Highlands moss county record data is from Redfearn (1999) and liverwort data from Timme & Redfearrn (1997); basis for Oklahoma moss county record data is from Bowers (1991) and Missouri non-Interior Highlands data from Gier (1955). Missouri county records are indicated only by county name, while Illinois and Oklahoma county records are identified by county and state abbreviation.

Volunteer, Missouri Botanical Garden, P. O. Box 299, St. Louis MO 63166
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MOSSES

AMBLYSTEGIACEAE

Hygroamblystegium fluviatile (Hedw.) Loeske - Pike: Clinton Spring Roadside Park, Louisiana, Darigo & Sullivan 3399.

H. tenax (Hedw.) Jenn. var. *tenax* - Bollinger: Castor River Conservation Area, Darigo 3505. Cape Girardeau, Apple Creek Conservation Area, Darigo & Clauson 3499. Dunklin: Department of Natural Resources property, SW of Malden, Summers et al. 9239.

Leptodictyum. riparium (Hedw.) Warnst.- Pike: DuPont Reservation Conservation Area, Darigo & Sullivan 3398.

AULACOMNIACEAE

Aulacomnium heterostichum (Hedw.) Bruch & Schimp. *in* B.S.G.- Dunklin: Department of Natural Resources property, SW of Malden, Summers et al. 9241.

A. palustre (Hedw.) Schwaegr.- Bollinger: private property S of Castor River Conservation Area, Darigo & Clauson 3509.

BARTRAMIACEAE

Philonotis fontana (Hedw.) Brid. var. *fontana* - Douglas: Sparkling Hollow, Allen 21664.

BRACHYTHECIACEAE

Brachythecium acuminatum (Hedw.) Aust. var. *cyrtophyllum* (Kindb.) Redf. & Crum - Randolph-IL: Turkey Bluffs State Fish & Wildlife Area, Darigo 3325. Common in Missouri, but infrequently collected. Differs from var. *acuminatum* in having broader, more concave, acute leaves and shorter leaf cells.

B. laetum (Brid.) B.S.G..- Pike: River of Peace Hebrew Cemetery, Louisiana, Darigo & Sullivan 3395. Randolph-IL: Cole Memorial Park, Chester, Darigo 3324.

Bryhnia graminicolor (Brid.) Grout - Pike: Ted Shanks Conservation Area, Darigo & Sullivan 3396.

Bryoandersonia illecebra (Hedw.) Robins.- Dunklin: Department of Natural Resources property, SW of Malden, Summers et al. 9236.

Eurhynchium pulchellum (Hedw.) Jenn var. *pulchellum*.- Pike: Ted Shanks Conservation Area, Darigo & Sullivan 3397.

BRYACEAE

Bryum caespiticium Hedw.- Roger Mills-OK: Washita Battlefield National Historic Site, Darigo & Darigo 3447. Warren: Katy Trail State Park, Dutzow, Darigo 3314.

B. capillare Hedw. var. *capillare* - Atchison: Rockport Inn Motel, Rockport, Darigo & Darigo 3414.

B. dichotomum Hedw.- Cape Girardeau: Pear Tree Inn Motel, Cape Girardeau, Darigo 3493. Uncommon.

Pohlia wahlenbergii (Web. & Mohr) Andrews.- Jackson-IL: Little Grand Canyon Natural Area, Shawnee National Forest, Harris & Darigo 20. Wayne: Corps of Engineers property, S of Shook, Summers 9075.

CLIMACIACEAE

Climacium americanum Brid.- Bollinger: Castor River Conservation Area, Brant 4204.

C. kindbergii (Ren. & Card.) Grout - Butler: Allred Lake Natural Area, Summers & Hudson 9420. Iron: Bismarck Lake Conservation Area, Summers et al. 8809.

FISSIDENTACEAE

Fissidens adianthoides Hedw.- Douglas: Sparkling Hollow, Allen 21643. Uncommon.

F. osmundioides Hedw.- Douglas: Sparkling Hollow, Allen 21646. Uncommon.

FONTINALACEAE

Fontinalis novae-angliae Sull. var. *latifolia* Card.- Bollinger: Castor River Conservation Area, Brant 4283. Previous Missouri listings as "*F. novae-angliae* Sull. var. *novae-angliae*" are possibly *F. novae-angliae* Sull. var. *latifolia* Card.

HELODIACEAE

Helodium paludosum (Sull.) Aust.- Bollinger: Castor River Conservation Area, Brant 4203. Rare, listed as S1 (Critically Imperiled) in Missouri (Anonymous, 1999)

HYPNACEAE

Hypnum lindbergii Mitt.- Cape Girardeau: Trail of Tears State Park, Darigo & Summers 3498.

Pylaisiella selwynii (Kindb.) Crum et al.- Douglas: Sparkling Hollow, Allen 21665.

LEUCOBRYACEAE

Leucobryum glaucum (Hedw.) Ångstr. *in* Fries - Dunklin: Department of Natural Resources property, SW of Malden, Summers et al. 9233.

MNIACEAE

Plagiomnium ciliare (C. Müll.) T. Kop.- Bollinger: Castor River Conservation Area, Brant 4205.

P. cuspidatum (Hedw.) T. Kop.- Dunklin: Department of Natural Resources property, SW of Malden, Summers et al. 9235.

P. rostratum (Schrad.) T. Kop.-Douglas: Sparkling Hollow, Allen 21678. Listed as S1 (critically imperiled) in Missouri (Anonymous 1999).

ORTHOTRICHACEAE

Drummondia prorepens (Hedw.) Britt.- Bollinger: Castor River Conservation Area, Darigo 3507. Scott: Tywappity Community Lake, Darigo & Clauson 3512.

Orthotrichum diaphanum Brid.- Beckham-OK: I-44 W-bound rest area, Darigo & Darigo 3446.

POLYTRICHACEAE

Atrichum angustatum (Brid.) Bruch & Schimp. *in* B.S.G.- Dunklin: Department of Natural Resources property, SW of Malden, Summers et al. 9234.

Polytrichum commune Hedw. var. *commune* - Bollinger: private property S of Castor River Conservation Area, Brant & Lee 4275. Dunklin: Department of Natural Resources property, SW of Malden, Summers et al.9238.

POTTIACEAE

Astomum muehlenbergianum (Sw.) Grout - St. Charles: Weldon Spring Conservation Area, Darigo & Holmberg 3310. St. Louis: Route 66 State Park, Darigo & Darigo 3460. Uncommon.

Syntrichia papillosa (Wils. *in* Spruce) Jur.- Ozark: Caney Mountain, Allen 21712A. Rare, listed as S? (Unranked) in Missouri (Anonymous 1999).

Weissia jamaicensis (Mitt.) Grout - Franklin: Whiskey Creek Sheep Farm, SW of Krakow, Holmberg 2. Uncommon.

SPHAGNACEAE

Sphagnum lescurii Sull. *in* Gray - Madison: S-F Scout Ranch, Summers et al. 9309.

THUIDIACEAE

Thuidium delicatulum (Hedw.) Schimp. *in* B.S.G.- St. Charles: Busch Conservation Area, Darigo & Darigo 3456.

LIVERWORTS

ANEURACEAE

Aneura pinguis (L.) Dum.- Washington: Washington State Park, Holmberg 6. Listed as SU (Unrankable) in Missouri (Anonymous 1999).

AYTONIACEAE

Mannia fragans (Balbis) Frye & Clark - Franklin: Hertein property, SW of Krakow, Holmberg 5.

Reboulia hemisphaerica (L.) Raddi - Franklin: Hilke property, SW of Krakow, Holmberg 4. Union-IL: Giant City State Park, Darigo 3329.

CONOCEPHALACEAE

Conocephalum conicum (L.) Lindb.- Bollinger: Castor River Conservation Area, Harris 24. Douglas: Sparkling Hollow, Allen 21670. St. Charles: Weldon Spring Conservation Area, Darigo & Holmberg 3311.

JUNGERMANNIACEAE

Jamesionella autumalis (DC.) Steph. var. *autumalis* - Franklin: Whiskey Creek Sheep Farm, SW of Krakow, Holmberg 7. Jackson-IL: Giant City State Park, Darigo & Clauson 3327.

LOPHOCOLEACEAE

Lophocolea heterophylla (Schrad.) Dum.- Wayne: Mark Twain National Forest, Summers & Brant 8702A.

MARCHANTIACEAE

Marchantia polymorpha L.- Pike: Clinton Spring Roadside Park, Louisiana, Darigo & Sullivan 3400.

PALLAVICINIACEAE

Pallavicinia lyellii (Hook.) Carruth.- Bollinger: private property S of Castor River Conservation Area, Brant & Lee 4279.

PELLIACEAE

Pellia sp. Raddi - Jackson-IL: Little Grand Canyon Natural Area, Shawnee National Forest, Harris & Darigo 22.

RICCIACEAE

Riccia stenophylla Spruce - Ripley: King Bee Spring, NE of Flatwoods, Hudson. Has been reported only once previously in Missouri.

Ricciocarpos natans (L.) Corda - Howell: Tingler Lake Conservation Area, Harris 23. Warren: Katy Trail State Park, Dutzow, Darigo & Sullivan 3489

SCAPANIACEAE

Scapania nemorea (L.) Grolle - Bollinger: private property S of Castor River Conservation Area, Brant & Lee 4278. Dunklin: Department of Natural Resources property, SW of Malden, Summers et al. 9232.

Acknowledgments: The author wishes to thank Bruce Allen, Alan Brant, Jack Harris, Nels Holmberg, Stan Hudson and Bill Summers for permission to publish their collections, Frank Bowers for use of his Oklahoma Moss Checklist (1991), Bruce Allen and Alan Whittemore for sharing their time and expertise, Jeanne Clauson, Dolly Darigo, Jack Harris, Nels Holmberg, Father James Sullivan and Bill Summers for their collecting help, and Webster Groves Nature Study Society members for their interesting outings.

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Trichostomum tenuirostre var. *gemmiparum* new to the United States.

P. M. Eckel

While reexamining a duplicate fragment of a collection of *Trichostomum tenuirostre* from Missouri, initially determined to be *Tortella mollissima* Broth. ex Bartr. (Redfearn 1969), rhizoidal tubers were detected. Such tubers place the specimen as *Trichostomum tenuirostre* var. *gemmiparum* (Schimp.) Zand. hitherto not reported for the North American moss flora (Anderson et al. 1990).

> Missouri: Douglas County, rocky slopes along Greasy Creek ca. 2.5 miles SE of Ann. SW 1/4 sect. 16, NE 1/4 sect. 20, R. 11 W., T. 27 N; mixed with *Myurella sibirica* (Mull.) Reim. on moist vertical dolomite; Paul L. Redfearn, Jr., April 16, 1967, no. 21330 (NY)

The variety is not uncommon in Mexico where its presence was recorded from eight states in that country (Zander 1994a). It occurs also in Cuba, Haiti, Brazil, Europe and India (Zander 1978). Eckel (1996) has recently reported its occurrence in Japan. The rhizoids of the Missouri specimen are conspicuously long and deep red-brown, the brood bodies dark, multicellular, thick-walled knobs distributed along their length. The leaf basal cells are thin-walled, clear and lax but do not extend appreciably up the margins forming a V-shape at the base of the lamina as in *Tortella*. The marginal cells are distinctively transversely-elongate, the margins are distantly toothed and have a tendency to deteriorate: all characters of *Trichostomum tenuirostre*.

The general aspect of the Missouri specimens is that of that suite of easily confused attenuate- or flagelliform-leaved species: *Pseudosymblepharis schimperiana* (Par.) Crum, *Tortella tortuosa* (Hedw.) Limpr. (in northern Mexico and the Caribbean region) and *Trichostomum tenuirostre*. Both *Pseudosymblepharis schimperiana* and *Trichostomum tenuirostre* can have extremely long and thin, attenuate leaves that are tattered in appearance due to the fragility of the lamina (both illustrated by Zander 1994a,b). The basal cells of *Tortella tortuosa* are distinctively in a steep V-shape without distant marginal teeth or transversely-elongate marginal cells or a tendency to tatter.

Tortella mollissima (as *Trichostomum mollissimum* (Broth. ex Bartr.) Crum) has recently been united with *Pseudosymblepharis schimperiana* (Zander 1994a).

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Bryophytes of Riparian Areas in the Toiyabe Range of Central Nevada

Kerry L. Heise

The state of Nevada remains one of the least surveyed regions for bryophytes in the Intermountain West. In spite of this a number of investigators have worked in the region (Watson 1871; Cardot & Theriot 1904; Clark 1957; Lawton 1958; Flowers 1973; Mozingo 1976; Lavin 1981, 1982; Whittemore 1994; Eckel 1996; Stark & Whittemore *in press*). In addition, Spence (1988) summarized the moss flora of the Intermountain region, which included the entire state of Nevada.

During the summer months of 1995 and 1996 I conducted an inventory of bryophytes at 16 riparian sites in the Toiyabe Range of central Nevada. The collection of 31 moss and 2 liverwort species adds substantially to the bryophytes associated with riparian areas found by Lawton (1958) in central Nevada and includes the addition of three new moss species to the state: *Bryum weigelii* Spreng. *in* Biehler, *Mnium blyttii* Bruch & Schimp. *in* B.S.G., and *Tortula mucronifolia* Schwaegr. (Table 1).

The collection sites were located in 8 drainages, 7 located on the west flank and 1 on the east flank of the Toiyabe Range between 1,800 and 2,700 meters (Figure 1). The upland vegetation within this elevation zone is typically a *Pinus monophylla* and *Juniperus osteosperma* woodland. Streams reach their greatest width and volume here before their flow is rapidly reduced due to percolation and evaporation upon reaching the basin below. Common species along streambanks and adjacent seep meadows include *Salix exigua, S. lutea, S. boothii, Betula occidentalis, Carex nebrascensis*, and *Juncus balticus.* All collections were made within riparian areas that ranged from sedge/grass dominated channels a meter wide to meadow-channel complexes of willow, aspen and cottonwood over 100 meters across (Weixelman et al. 1996). Voucher specimens were deposited in the herbarium at the California Academy of Sciences (CAS), Botany Department, California Academy of Sciences, Golden Gate Park, San Francisco, CA 94118.

In general, bryophyte richness was highest in semi-disturbed sites with high substrate diversity. These sites were often found along creek channels that retained mature, well-anchored vegetation and rocks, but were frequently scoured enough to provide bare patches for colonization of opportunistic taxa such as *Bryum sp., Funaria hygometrica*, and *Hennediella heimii.* In contrast, perched seep meadows adjacent to creek channels not subject to flooding were lower in species richness, although extensive mats composed of *Cratoneuron filicinum, Conardia compacta,* *Amblystegium serpens,* and *Marchantia polymorpha* commonly covered these sites. Bryophyte richness and abundance were lowest in the most inundated sites characterized by a high percent of bare ground, rock and gravel. These observations are similar in many respects to studies that have examined the role of disturbance on the composition of riparian bryophyte communities (Kimmerer & Allen 1982; Gignac et al. 1991; Muotka & Virtanen 1995).

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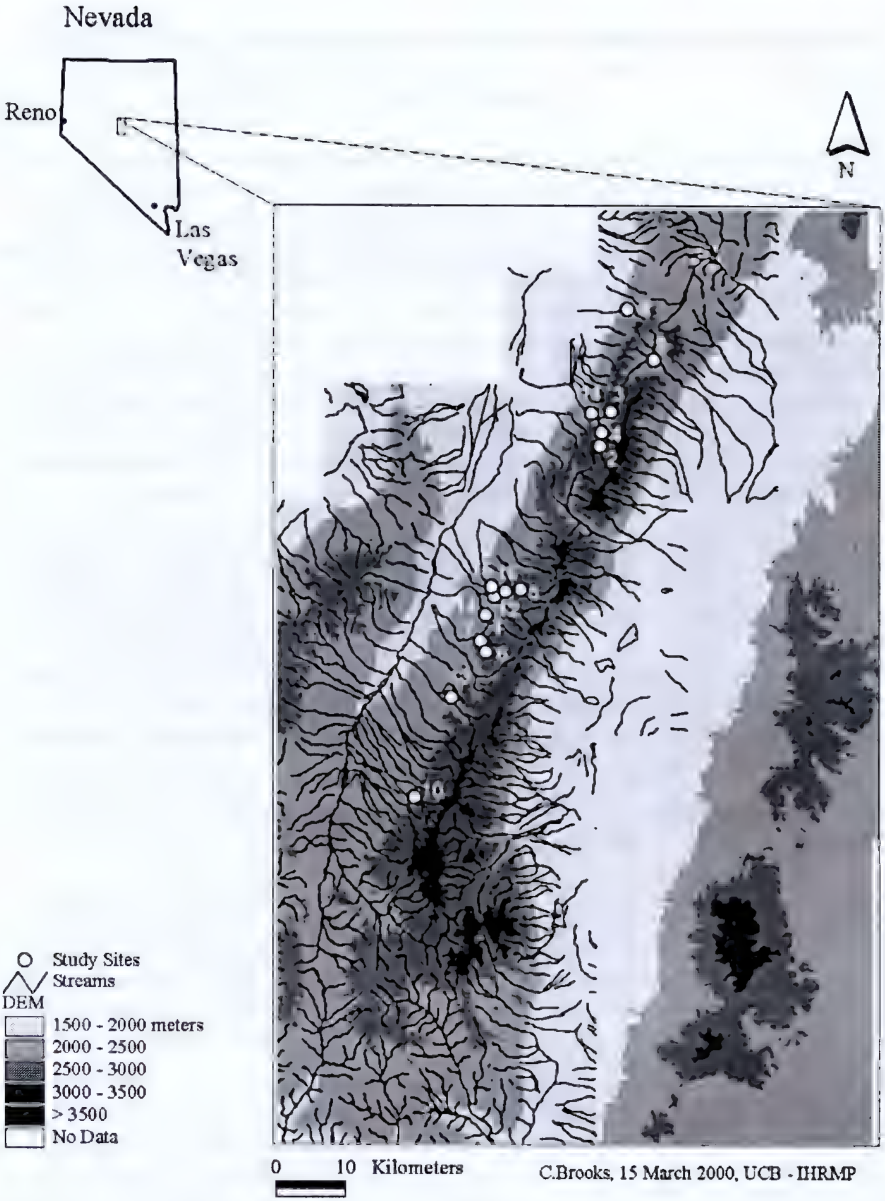

C.Brooks, 15 March 2000, UCB - IHRMP

Figure 1. Bryophyte collection sites in the Toiyabe Range, Humboldt-Toiyabe National Forest, Nevada. Refer to Table 2 for site descriptions.

Table 1. Riparian bryophytes collected in the Toiyabe Range, Central Nevada. All collections by author; number in parentheses refers to collection site (Table 2). Nomenclature for bryophytes largely conforms to Stotler and Crandall-Stotler (1977), Anderson et al. (1990), and Zander (1993).

Bryopsida

Amblystegiaceae

Amblystegium serpens (Hedw.) Schimp. *in* B.S.G. var. *serpens*: 5100(1), 5102(2), 5110(2), 5125(4), 5137(5), 6104(12), 6094(14), 6128(15)

Cratoneuron filicinum (Hedw.) Spruce: 5107(2), 5112(2), 5126(4), 5133(5), 5139(5), 6099(11), 6097(13), 6117(14), 6125(15), 6120(16), 6101(16), 6090(16), 6130(11)

Conardia compacta (C. Müll.) Robins: 5101(2), 5104(2), 5097(2), 5115(2), 5116(2), 5118(2), 5121(4), 5127(4)

Drepanocladus aduncus (Hedw.) Warnst. var. *aduncus*: 5095(7), 5093(7), 6116(13), 6127(15)

Drepanocladus sordidus (C. Müller) L. Hedenäs *in* W.R. Buck: 6098(12)

Leptodictyum humile (P. Beauv.) Ochyra: 5108(3), 5130(4), 6119(16)

Palustriella falcata (Brid.) Hedenäs: 6100(16)

Bartramiaceae

Philonotis fontana (Hedw.) Brid. var. *fontana*: 5142(10), 6105(12)

Brachytheciaceae

Brachythecium frigidum (C. Müll.) Besch.: 5129(6), 5144(10), 6122(15), 6188(16), 6090(16)

Brachythecium nelsonii Grout: 6106(12)

Homalothecium nevadense (Lesq.) Ren. & Card.: 5143(8)

Bryaceae

Bryum argenteum Hedw.: 5122(4)

Bryum caespiticium Hedw.: 5094(4)

Bryum lisae De Not.: 5099(1), 5109(2), 5128(7)

Bryum pallens (Brid.) Sw. *in* Röhl.: 6129(11), 6108(12), 6114(13), 6091(16)

Bryum pseudotriquetrum (Hedw.) Gaertn.et al.: 5120(7), 6107(12)

Bryum weigelii Spreng.*in* Biehler: 5111(2), 5136(5)

Leptobryum pyriforme (Hedw.) Wils.: 5098(2), 5096(2), 6103(12)

Pohlia wahlenbergii (Web. & Mohr) Andrews: 5119(2), 6093(14)

Funariaceae

Funaria hygrometrica Hedw.: 5124(4), 5131(4), 6096(13)

Grimmiaceae

Grimmia anodon Bruch & Schimp. *in* B.S.G.: 5117(3)

Mniaceae

Mnium blyttii Bruch & Schimp. *in* B.S.G.: 6124(15)

Plagiomnium ellipticum (Brid.) T. Kop.: 5141(9)

Orthotrichaceae

Orthotrichum cupulatum Brid.: 5105(3)

Orthotrichum laevigatum Zett.: 5103(1), 5114(2), 5140(8)

Pottiaceae

Bryoerythrophyllum recurvirostre (Hedw.) Chen: 6112(13)
Hennediella heimii (Hedw.) Zand.: 5123(4), 5132(4)
Tortula mucronifolia Schwaegr.: 5138(5)
Tortula norvegica (Web.) Wahlenb. *ex* Lindb.: 5145(8)
Tortula papillosissima (Copp.) Broth.: 5106(1)
Tortula ruralis (Hedw.) Gaertn. et al.: 5113(1), 5148(1)

Hepaticopsida

Geocalycaceae

Chiloscyphus polyanthos (L.) Corda.: 5147(10)

Marchantiaceae

Marchantia polymorpha L.: 5092(4), 5134(5), 5146(10), 6095(13), 6126(15)

Table 2. Bryophyte collection sites in the Toiyabe Range, Humboldt-Toiyabe National Forest, Nevada.

1 - On north-facing boulder in shade of pinyon pine, at edge of aspen and cottonwood adjacent to creek. 5148 on soil and needle litter under pinyon tree. San Juan Creek, Nye Co. 2,134 m. 15N, R42E, S29, SW1/4. 6-7-95.
2 - In wet *Carex nebrascensis/C. rostrata* seep meadow between clumps of *Betula occidentalis* and *Salix boothii.* 5101, 5098, 5114 on birch bark; 5102, 5104, 5115, 5118 on soil on dead birch branch. Big Creek, Lander Co. 2,438 m. T17N, R43E, S26, SW1/4. 6-17-95.
3 - On shaded, granite boulder surrounded by mesic grass/sedge meadow previously burned. North-fork of Big Creek, Lander Co. 2,268 m. T17N, R43E, S12, SW1/4. 6-18-95.
4 - On moist soil bank with aspen and birch. 5125 on birch bark; 5126 in adjacent wet *Carex nebrascensis* seep meadow; 5127 on *Salix boothii* bark. Big Creek, Lander Co. 2,231 m. T17N, R43E, S23, NW1/4. 6-30-95.
5 - On wet organic layer in spring area adjacent to creek, with *Epilobium angustifolium, Cicuta douglasii,* and a variety of sedges and grasses. 5137, 5090 on rotten log; 5138 on soil on rotten log; 5139 on submerged rock. Washington Creek, Nye Co. 2,377 m. T15N, R42E, S23, NW1/4. 7-2-95.
6 - On submerged piece of wood in creek within aspen forest, with *Cicuta douglasii* and *Aquilegia formosa* at edge of water. San Juan Creek, Nye Co. 2,560 m. T14N, R42E, S3, NW1/4. 7-3-95.
7 - On wet sand between cobbles of gravel bar with *Salix boothii* and *S. lasiolepis*. Upper San Juan Creek, above Ranger Station. Nye Co. 2,304 m. T15N, R42E, S33, SE1/4. 7-3-95.
8 - On dry, shaded, north-facing boulder in aspen grove adjacent to creek. Veatch's Creek, Lander Co. 2,134 m. T18N, R43E, S1, NE1/4. 7-27-95.
9 - In wet *Carex rostrata/C. nebrascensis* meadow. Birch Creek, Lander Co. 2,182 m. T18N, R44E, S20, SW1/4. 7-30-95.
10 - On wet gravel and sand in seep area under aspen forest, with *Carex athrostachya* and *Deschampsia elongata*. 5147 on rock submerged in creek. Clear Creek, Nye Co. 2,682 m. T12N, R41E, S10, NE1/4. 7-29-95.
11 – On wet organic creek bank with *Salix boothii, S. lutea, S. exigua*. Big Creek, Lander Co. 2,109 m. T17N, R43E, S15, SE1/4. 7-13-96.

12 – On moist soil at creek bank with *Salix lutea* and *S. exigua*; 6107 on wet gravel; 6104, 6098 on rock. Cottonwood Creek, Nye Co. 2,085 m. T15N, R42E, S20, NW1/4. 7-11-96.

13 – On cobbles in creek channel with *Salix exigua* and *Poa pratensis.* 6114 on adjacent moist organic bank. Marysville Creek, Nye Co. 2,350 m. T13N, R41E, S1, NE1/4. 7-9-96.

14 – On moist soil bank with *Salix lutea* and *S. exigua.* San Juan Creek, Nye Co. 2,134 m. R42E, T15N, S29, NW1/4. 7-8-96.

15 – In *Carex nebrascensis* seep meadow adjacent to creek channel. 6126, 6122 on wet ground under sedges; 6127 on rotton log; 6125, 6124 on moist creek bank; 6128 on wood in meadow. Washington Creek, Nye Co. 2,182 m. R42E, T15N, S21, NE1/4. 7-10-96.

16 – On wet soil bank with S*alix lutea* and *S. exigua.* 6101 on rock; 6119 on dead wood. Washington Creek, Nye Co. 2,292 m. R 42E, T15N, S22, NE1/4. 7-10-96.

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Bryophytes of two Sinkholes of the North-central Karst Zone of Puerto Rico

Carmen M. Reyes-Colón[1] and Inés Sastre-DJ[2]

Abstract. The bryoflora of two sinkholes (Espiral and Empalme sinks) in the north-central karstic zone of Puerto Rico was studied. From both sinkholes 50 species were recorded: 31 mosses (11% of the moss flora of Puerto Rico) and 19 liverworts (8% of the liverwort flora of Puerto Rico). Twenty-nine and 42 species were collected in the Espiral and Empalme Sinks, respectively. The bryoflora of the sinkholes is very different from the bryoflora in the forests of Puerto Rico and both sinkholes may be a center of diversity for bryophytes species in the area.

Resumen. Se estudió la brioflora de dos sumideros (Sumideros Espiral y Empalme) de la zona cárstica norte central de Puerto Rico. De ambos sumideros 50 especies fueron colectadas: 31 musgos (el 11% de la flora de musgos de Puerto Rico) y 19 hepáticas (el 8% de la flora hepática de Puerto Rico). Ventinueve y 42 especies fueron colectadas en el Sumidero Espiral y Empalme, respectivamente. La brioflora de los sumideros es muy diferente de la brioflora de los bosques de Puerto Rico y ambos sumideros podrían ser un centro de diversidad de especies de briófitos en el área.

The bryoflora of Puerto Rico has been studied by bryologists since the beginning of this century (Sastre-DJ and Santiago-Valentín, 1996). These studies, which were conducted mostly in the Cordillera Central and the Luquillo forest, resulted in the completion of different checklists (Evans 1902-1912; Britton, 1915; Pagán, 1939; Gradstein, 1989; Sastre-DJ and Buck, 1993; Serrano, 1997) and a flora (Crum and Steere, 1957). Another contribution to the knowledge of the island bryoflora is Buck (1998), who listed many of the pleurocarpous mosses of the island.

The recent work on the bryophytes of Puerto Rico contribute to a more complete knowledge of the moss flora of Puerto Rico. According to Sastre-DJ and Buck (1993) the moss flora of Puerto Rico consists of 39 families in 121 genera with 284 species; Reyes-Colón and Sastre-DJ (1998) reported one new record for the island and Buck (1998) also added one new record: *Meteorium deppei* (Müll.) Mitt., raising the moss flora of Puerto Rico to 287 species.

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Crum and Steere (1957) reported 268 species of mosses for the island, of which 32 were growing on calcareous and limestone substrates in the karstic zone of the island; this represents 12% of the island's bryoflora. Sastre-DJ and Buck (1993) reported 65 species of mosses growing on limestone substrates, 23% of the local flora. Serrano (1997) studied disturbed areas in five forests of the karstic zone, but this work was mostly done on mogotes (conical hills). Thirty-three species were found and 12 of them were new records for a particular forest. The percentage of pleurocarpous species was greater than that of acrocarpous species (Serrano, 1997). Escorcia-Ariza (1998), in her work in industrialized sites of Puerto Rico, found that the bryoflora of these sites represents 8% of the island's bryoflora and 40% of the bryoflora of the karstic area.

Some records from limestone areas are: *Riccia brittonii* and *R. violacea* described by Howe and reported by Britton (1915) for Mona Island, Sastre-DJ (1995) new report of *Thamnobryum tumidicaule* (K.A.Wagner) F.D.Bower for Puerto Rico. The latter is an interesting record because in the Greater Antilles it was only known from Jamaica. Sastre-DJ and Buck (1993) reported *Hypopterygium tamariscinum* (Hedw.) Brid. and *Thamnobryum fasciculatum* (Sw. ex Hedw.) I.Sastre, for the Sumidero Tres Pueblos and both species were formerly known only from higher elevation in Puerto Rico.

A new record for Puerto Rico, *Plaubelia sprengelii* (Schwägr.) R.H.Zander, and the rediscovery of *Pireella cymbifolia* (Sull.) Cardot and *Bryum coronatum* Schwägr. on Mona Island limestones by Reyes-Colón and Sastre-DJ (1998) are examples of the under sampling of these areas. The latter species had not been found since their original collection in 1939 and 1940, respectively (Sastre-DJ and Santiago-Valentín, 1996). All these studies emphasized mosses; for liverworts Pagán (1939) reported that 4% of the hepatic flora occurs on limestone substrates. Reyes-Colón and Sastre-DJ (unpubl. data) found that 21% of the liverwort species occur on limestone forests of Puerto Rico.

Our objective was to collect and list the bryoflora of two sinkholes in the north-central karst zone of Puerto Rico. We also calculated the Sorense´s Index to compare the species composition of the sinkholes with forest in Puerto Rico in order to evaluate them as areas for conservation.

The study area is located within the karst topography of Puerto Rico and the study site consisted of two sinkholes. The karst belt in Puerto Rico is an Oligocene formation and it extends over 18 km x 120 km east from Aguadilla to Loíza (Monroe, 1968). The karst formation of Puerto Rico is characterized by sinkholes and mogotes. Sinkhole formations are mostly circular depressions in a plain, with a depth that ranges from 10 m to more than 130 m (Monroe, 1976). Mogote formations are isolated cone hills; their top surfaces are concordant with one another but very discontinuous, and vertical cliffs are common. The entire region is in the subtropical moist forest life zone (Ewel and Whitmore, 1973). Mean annual temperature of the region is 18° to 24° C and the mean annual rainfall is 1000 to 1100 mm (Ewel and Withmore, 1973).

The two sinkholes - Espiral and Empalme - studied are in the Parque de Las Cavernas del Río Camuy. This park is located in the municipalities of Camuy, Hatillo and Lares. The Espiral Sink is located at latitude 18°20'34" N and longitude 66°49'60" W. It is 340 m deep. Empalme Sink is located at latitude 18° 20'57" N and longitude 66°49'60" W, at the intersection of PR road #129 and PR road #455. It is 50 meters wide and 125 meters deep. At the bottom of the sinkhole is the largest cave (Cueva Clara) in the Río Camuy Cave System.

Bryophytes were collected during 20 field trips to the Parque de Las Cavernas del Río Camuy between September 1998 and April 1999. Samples were collected in paper bags, air dried and identified in the laboratory using the keys available for each group (Gradstein, 1989; Fulford, 1963-1976; Miller and Russell, 1975; Sharp et al.,1984; Churchill and Linares, 1995). The species' nomenclature followed Sastre-DJ and Buck (1993) and Buck (1998) for mosses and Evans (1902-1912), Fulford (1963-1976), Gradstein (1989) and Yano and Gradstein (1997) for liverworts and hornworts. Voucher specimens were deposited in the Herbarium of the Department of Biology at the University of Puerto Rico, Mayagüez Campus (MAPR).

In this inventory the sinkhole bryoflora consists of 21 families, 34 genera and 50 species (Table 1). Fourteen families, 22 genera and 31 species of mosses were found; ten species were acrocarpous and 21 pleurocarpous. Seven families, 12 genera and 19 species of liverworts were found, of which 14 species were foliose and five have a thallose growth form (Table 1). No hornworts were found.

The Lejeuneaceae, with eight species, is the most diverse family of the Jungermanniophyta. In the Bryophyta the Fissidentaceae with seven species and the Pilotrichaceae with five species were the most diverse families. The genus *Fissidens* presents the highest number of species (seven) followed by *Lejeunea* with four and *Cyclodictyon* with three species.

The sinkholes comprise 33% of the mosses reported for karst forests: Guajataca, Vega, Cambalache and Río Abajo. The liverwort flora of the sinkholes comprises 51% of the liverwort flora reported for the karst forests. In addition they comprise 11% of the island's moss flora and 8% of the island's liverwort flora. These figures show that both sinkholes may be acting as a center of diversity for bryophyte species in this area and that protection and management of the zone are needed.

In the Espiral Sink 29 species were collected (Table 1); these species were forming extensive mats on their substrates. In the Empalme Sink 42 species were collected (Table 1). These sinkholes have 21 species in common and the Sørensen's Index between them shows a similarity of 0.59.

Although the sinkholes show a high percentage of similarity their bryoflora is very different from the flora of the karst forests: Río Abajo (33%), Guajataca (22%), Cambalache (14%) and Vega (7%). It was expected that the sinkholes would share more species with forests of the karst zone due their similarity in substrate and life zone (subtropical moist forest). These differences could be explained based on the studies done to date of island's limestone bryoflora; many of them were conducted on mogotes, which have less humidity and higher temperatures than the sinkholes, factors that influence species composition in this area. These forests and the sinkholes are within the same type of life zone and receive similar amounts of rainfall; the differences in species composition reflect the fact that sinkholes retain more humidity than mogotes, which are more exposed to light and wind effects.

In table 2 we show the comparison between the sinkholes with the different forest of Puero Rico). The highest similarity found was with Luquillo forest (40%), followed by Maricao and Toro Negro. These higher percentages of similarity found with the high elevation forest could reflect the fact that these are the forests with the highest numbers of species so there is a greater probability to find species in common.

Some of the species found occur out of their normal elevational range: *Fissidens intramarginatus* (400 - 600 m), *F. papillosus* (500 - 2750 m), *Meteorium deppei* (800 - 2000 m) and *Pilotrichidium antillarum* (500 - 1000 m). These species occur in localities with a high percentage of relative humidity and high rainfall. Their presence in the sinkholes studied can be explained by the high percentage of relative humidity present in them (80% - 95%), which provides an environment similar to cloud forest conditions. Similarity index (Table 2) also confirms that the highest similarity in the moss flora was found with high elevation and more humid forests of Puerto Rico. The same pattern was found in Malaya (Mohamed, 1987), where mosses that usually only occur at higher elevations were found growing on limestone substrates. The environmental characteristics of the sinkholes permit the establishment of a richer flora (Robinson and Wells, 1956).

The richness found for the Lejeuneaceae and Fissidentaceae (Table 1) follows the pattern observed in the flora in general, as noted in Sastre-DJ and Buck (1993) and Reyes-Colón and Sastre-DJ (1998). The bryoflora of the two sinkholes inventoried also follows the patterns described by van Reenen and Gradstein (1984) that is at low elevations they found more mosses than liverworts.

Sixteen species could be proposed as representative of the karst zone bryoflora of Puerto Rico because they occur on both types of environments, mogotes and sinkholes (Sastre-DJ and Buck, 1993; Serrano, 1997; Escorcia-Ariza, 1998). These species are: *Calymperes afzelii*, *Crossomitrium epiphyllum*, *Entodon macropodus*, *Fissidens dissitifolius*, *F. elegans*, *F. steerei*, *Hyophyladelphus agrarius*, *Neckeropsis disticha*, *N. undulata*, *Pireella cymbifolia*, *Semathophyllum subpinnatum*, *Syrrhopodon incompletus* var. *berteroanus*, *Taxiphyllum taxirameum*, *Taxithelium planum*, *Vesicularia vesicularis* var. *portoricensis* and *Zelometeorium patulum*.

Sixty-eight percent of the moss species present in the sinkholes were pleurocarpous and 74% of the liverwort species were leafy liverworts. Serrano (1997) also found that pleurocarpous species were dominant in the mogotes. One might suppose that because these sinkholes have characteristics similar to cloud forest (mist, high relative humidity percentage and low temperatures) they are favorable for the establishment of pleurocarpous mosses and leafy liverwort species.

A more complete floristic inventory that would include more sinkholes, i.e. Tres Pueblos the largest sinkhole, in the karst topography is needed because it could provide new records or perhaps new species for the island. Myers (1988) proposed that many localities in the tropics can be identified as "hot spots" because they have many species with exceptional endemism rates that face great degrees of threat. More studies are needed in order to detect and identify possible "hot spots" areas on the island.

Limestone formations in Puerto Rico are subject to high levels of threat, due to the development of urban areas as well as clearing. This inventory will also provide useful information about species distribution on the island and can be used for biogeographical and conservation studies. Education in the roles of bryophytes in the forest and information on this group of plants need to be accessible to the public in order to protect their habitat.

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Table 1. Floristic inventory of two sinkholes of the north-central krast zone, Puerto Rico: Espiral Sink (EsS) and Empalme Sink (ES). Families in alphabetical order.

Family	species	locality	
		EsS	ES
Calymperaceae	*Calymperes afzelii*		*
	Syrrhopodon incompletus var. *berteroanus*	*	
	Rhynchostegium serrulatum		*
Entodontaceae	*Entodon macropodus*	*	
Fissidentaceae	*Fissidens dissitifolius*	*	*
	F. elegans	*	
	F. intermedius	*	*
	F intramarginatus		*
	F. papillosus		*
	F. steerei		*
	F. zollingeri	*	
Hypnaceae	*Isopterygium subbrevisetum*	*	*
	Taxiphyllum taxirameum	*	*
	Vesicularia vesicularis var. *portoricensis*	*	*
Leptodontaceae	*Pseudocryphaea domingensis*	*	*
Meteoriaceae	*Meteorium deppei*	*	
	Zelometeorium patulum		*
Myriniaceae	*Helicodontium capillare*	*	*
Neckeraceae	*Neckeropsis disticha*	*	*
	N. undulata		*
Pilotrichaceae	*Crossomitrium epiphyllum*	*	*
	Cyclodictyon albicans	*	*
	C. albicaule	*	*
	C. bicolor	*	*
	Pilotrichidium antillarum	*	*
Pottiaceae	*Hyophyladelphus agrarius*		*
Pterobryaceae	*Pireella cymbifolia*		*
Sematophyllaceae	*Pteriogonidium pulchellum*		*
	Sematophyllum subpinnatum		*
	Taxithelium planum	*	
Thuidiaceae	*Thuidium urceolatum*	*	
Jungermmaniopsida			
Aneuraceae	*Aneura pinguis*	*	*
	Riccardia digitiloba	*	*
	Riccardia sp.		*
Geocalycaceae	*Lophocolea bidentata*	*	*
Lejeuneaceae	*Cyclolejeunea convexistipa*		*
	Drepanolejeunea mosenii		*
	Lejeunea cladogyna	*	*
	L. laetevirens		*

Family	species	locality EsS	ES
	L. minutiloba	*	*
	Lejeunea sp.	*	*
	Leptolejeunea elliptica	*	*
	Taxilejeunea obtusangula		*
Marchantiaceae	*Dumortiera hirsuta*		*
Monocleaceae	*Monoclea gottschei*		*
Plagiochilaceae	*Plagiochila hypnoides*		*
	Plagiochila sp.	*	*
Radulaceae	*Radula evansii*		*
	R. subsimplex		*
	Radula sp.	*	

Table 2. Sørensen's Index of Similarity comparing the different forests of Puerto Rico with the sinkholes: Espiral and Empalme Sinks using mosses.

Forest	Index of similarity (%)
Luquillo	40.36
Maricao	38.83
Toro Negro	35.16
Río Abajo	32.94
Guajataca	21.88
Carite	19.67
Mona	19.67
Pueblo	19.67
Cambalache	13.56
Guilarte	13.56
Tortuguero	10.91
Guánica	7.80
Vega	6.67
Guaniquilla	4.35
Susúa	4.35

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New State & County Mosses for Massachusetts

Susan A. Williams

Collection of mosses from 1996 to 1999 have resulted in one new State record and 19 new County records for Massachusetts. All collections were made by the author unless otherwise noted and provide additions to the 'List of Massachusetts Mosses', an unpublished list compiled by Sarah Cooper-Ellis for the Massachusetts Natural Heritage Program mostly from published records (Hilferty, 1960; Judd, 1980; Mishler and Miller, 1983) and personal collections. All specimens were collected in the town of Rowe in Franklin County. All voucher specimens are deposited in the Farlow Herbarium in Cambridge, MA.

New State Record:

Schwetschkeopsis fabronia (Schwaegr.) Broth. Collected on dry ledge consisting mainly of talc-carbonate rock and steatite. *397.* Never before collected in Massachusetts. Crum & Anderson (1981) state the range of this moss to be from "New York to Michigan and south to Florida and Texas (more common in the southern part of the range)"

New Records for Franklin County:

Andreaea rupestris (Hedw.) Pelham Lake Park, south side of Todd Mt. on rock. *368.* Previously reported in Berkshire, Middlesex, and Norfolk Counties.

Anomodon rugelii (C. Muell.) Keissl. Pelham Lake Park, beach trail, on base of sugar maple. *419.* Previously reported in Berkshire, Bristol, and Hampden Counties.

Blindia acuta (Hedw.) BSG. Bear Swamp Upper Reservoir in wet meadow area covering stones. *407.* Previously reported in Plymouth County.

Dicranum viride (Sull. & Lesq.) Lindb. Pelham Lake Park, beach trail, base of sugar maple; also Switching station rich woods area on maple tree. *333.* Previously reported in Berkshire, Essex, Middlesex, Norfolk, Suffolk and Worcestor Counties.

Ditrichum lineare (Sw.) Lindb. Tunnel Rd. on dryish bank below the Bear Swamp dam right on the road edge. *359.* Previously reported in Barnstable, Berkshire, Bristol, Duke, Essex, Hampden, Middlesex, Norfolk and Suffolk Counties.

Entodon cladorrhizans (Hedw.) C. Muell. Soapstone area on rotten logs, also on rocks. *266.* Previously reported in Berkshire, Bristol. Essex, Hampden, Middlesex, Norfolk, Plymouth, and Worcestor Counties.

7 Middletown Hill Rd., Rowe, MA 01367. Email: sawrowe@shaysnet.com

Haplohymenium triste (Ces.ex de Not.) Kindb. Soapstone area, on a dry boulder in the woods. *409.* Previously reported in Berkshire and Bristol Counties.

Hygrohypnum eugyrium (BSG.) Loeske. Pelham Lake Park, small brook coming down old Saddle Brook Trail. Previously reported in Berkshire and Hampden Counties.

Leptobryum pyriforme (Hedw.) Schimp. Davis Mine area near shaft #2 on soil between old foundation. *414.* Previously reported in Berkshire, Bristol. Essex, Hampden, Middlesex, Nantucket, Norfolk, Plymouth, and Worcestor Counties.

Leskeella nervosa (Schwaegr.) Loeske. In woods above Brown Rd. and between Middletown Hill Rd. and Pond Rd., on tree bases. *442.* Previously reported in Berkshire and Bristol Counties.

Leucodon brachypus var andrewsianus Crum & Anderson. Above Brown Rd. in woods at the base of a tree. Collected by N. Williams. *363.* Previously reported in Berkshire, Essex, Hampden, Hampshire, Middlesex, Norfolk Counties.

Oncophorus wahlenbergii Brid. Soapstone area on rotten log in swampy area. *380.* Previously reported in Berkshire, Bristol, Essex and Middlesex Counties.

Pogonatum urnigerum (Hedw.) P. & Beav. Tunnel Road on bank in a dry rockyish area below the fence of the Bear Swamp Upper Reservoir Dam. *356.* Previously reported in Berkshire and Worcestor Counties.

Polytrichastrum alpinum (Hedw.) B.L. Sm. Var. *alpinum.* Soapstone area above large ledge on soil between rocks. *401.* Previously reported in Berkshire, Essex and Norfolk Counties.

Polytrichum pallidisetum Funck. Pelham Lake Park near Pelham Brook in shaded woods on humus. *422.* Previously reported in Berkshire, Hampden and Norfolk Counties.

Pottia truncata (Hedw.) Fuernr. Switching Station area on powerline roadcut on disturbed soil. *412.* Previously reported in Bristol, Essex, Middlesex, Norfolk, Plymouth and Suffolk Counties.

Racomitrium heterostichum (Hedw.) Brid. Soapstone area on ledges. *408.* Previously reported in Berkshire and Norfolk Counties.

Rauiella scita (P. Beauv.) Reim. Pelham Lake Park on start of beach trail at the base of a tree. *420.* Previously reported in Berkshire, Bristol, Essex, Hampden, Middlesex, Norfolk and Worcestor Counties.

Rhytidiadelphus squarrosa (Hedw.) Warnst. Above Brown road in the woods in a swampy area. *384.* Collected by N. Williams. Previously reported in Berkshire, Bristol, Essex and Worcestor Counties.

Sphagnum wulfianum Girg. At bottom of Switching Station access road in a low area in woods near a wooded swamp. Collected by N. Williams. Previously reported in Berkshire County. This species was listed in 1997 (Anderson et al) as a new State record.

Acknowledgements. I'd like to thank Nan Williams for bringing me her specimens. I'd also like to thank Bill Buck and Nancy Slack for verifying some of the specimens.

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Twenty-fifth Annual

A. Leroy Andrews Foray

Friday to Sunday, September 15 - 17, 2000
Schenectady Wintersports Club Lodge
Waterbury Center, Vermont

The A. Leroy Andrews Foray is organized to meet the interests of professionals, amateurs and students. Three different groups will be emphasized: Lichens, Sphagnums, and General Bryophytes. This year's area is a rich territory for all three interest groups to explore. All day Saturday and Sunday morning field trips will be planned including a trip up Mt. Mansfield. There will be plenty of time for microscope work both Friday and Saturday evenings.

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The cost of the foray will be $50 and will include Friday night dinner, Saturday breakfast, lunch and dinner and Sunday breakfast and lunch. Any day people will be charged a $15 registration fee. If day people want meals they will be priced individually at the time. Call or email me for list of motels if you prefer better accommodations.

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Leptopterigynandrum: Field observations and relevance to family designation

William A. Weber

Bill Steere (1977) described a new genus and species, *Garysmithia bifurcata,* from Alaska and Colorado. His paper was exceptionally detailed, with excellent illustrations. However, the taxon soon was found to belong to *Leptopterigynandrum austroalpinum* (Buck 1980), which was described by Carl Mueller (1897) from a specimen collected in Argentina. The genus is known now from several Andean countries, India, and Altai, although the species concepts are still unclear because of scarcity of collections.

Steere was puzzled by his specimens. He wrote: "In the absence of sporophytes, it is difficult to assign this plant to any known genus, or for that matter, to any particular family of mosses. I have placed it in the Leskeaceae because of its minutely papillose cells. It has been assigned there more as a matter of convenience than through conviction, since the julaceous stems and the cellular areolation, especially the dense alar groups of quadrate cells, suggest the Leucodontaceae."

Further he wrote, "All of the Alaskan specimens were collected without being recognized in the field as something of special interest, so that it would be difficult indeed to find the exact localities again. However, Dr. Hermann believes that he can relocate the Colorado station, and it is possible that sporophytes will eventually be found in populations that are kept under observation over a period of several years."

In addition to Steere's *Garysmithia bifurcata, Leptopterigynandrum austroalpinum* has gone under several other names, which attest to the equally puzzled attitude of their authors: *Pterigynandrum austro-alpinum* Fleischer (1912), *Heterocladium austro-alpinum* Brotherus (1907), and *Erythrodontium tenuicaule* R. S. Williams. Significantly, no names such as *Leskea, Leskeella,* or *Pseudoleskeella* have been proposed for it.

Until now, no living botanist has knowingly collected it in the field. All identifications have been made from herbarium specimens. I prepared my manuscript for FNA without having really understood the plant in the field. For several years I imagined it would resemble *Pseudoleskeella.* I knew the granite outcrops where I had found *Leptopterigynandrum* but really had no idea of its

University of Colorado Museum, Campus Box 315, Boulder, CO 80309

field appearance. However, after many false finds, I went back to the dried specimens in the herbarium and noticed that specimens of *Leptopterigynandrum* were not really dark green but a peculiar glaucous-green color, quite unlike *Pseudoleskeella.*

Returning to a known locality in April, 2000, Ron Wittmann and I began to look for a glaucous moss. Nothing we saw filled the bill. Finally, after a long search, Ron climbed up to a shelving ledge of granite below a huge overhang where we could see a bright apple-green moss in a horizontal crevice. He threw down a tuft, and I immediately recognized it, having memorized the characters only days before. With the information I have now, I can guarantee that an alert amateur can recognize *Leptopterigynandrum* in the field.

One must realize that the plant looks very different in the moist and dry states. Here is a little moss with apple-green foliage on extremely slender stems. When the leaves dry, they are a dull blue-green, never true green or blackish-green as in Leskeoid mosses. The stems usually creep over bare rock, never forming a dense, spreading mat. Rarely, when confined to a narrow crevice, erect, short shoots, rather tightly packed, not over a cm high, arise from a horizontal stem. When fresh, the upper leaves are brilliant green, and the lower ones are bleached straw-colored. One is reminded of *Myurella julacea.* The shoots are swollen-julaceous when fresh, the leaves concave with abruptly spreading tips, but on drying they shrivel and assume a blue-green, somewhat glaucous appearance, the tips usually hidden. Since our plants were found with tufts of *Fabronia,* there was a similarity in their appearance although *Fabronia* is a fraction of the size of *Leptopterigynandrum.*

Actually, the plants are more readily recognized in the field than they are upon microscopic study. The leaves are figured (Steere 1977) as having a strong costa, distinctly forked. Actually, the costa is very inconspicuous and blends imperceptibly with the adjacent laminal cells. I suppose that one cannot easily draw this subtlety without exaggerating. As for the "papillae", they are certainly not the type of papillae usually observed in Leskeaceae, but are exceedingly minute and not restricted to the individual cells. In Sharp, Crum, and Eckel (1994, Fig. 637) they are shown as scattered pin-pricks said to be visible only under oil-immersion. Buck (1980) shows electron microscope photographs (Fig. 33-34). These do not at all resemble the line drawing just referred to. Buck, in fact, calls them verrucae, and says they may be visible under 400X.

At a second locality (Colorado: Boulder Co.: "Little Royal Gorge" of Como Creek, a tributary of North Boulder Creek, 8,900 ft., Weber & Wittmann B-110617), we encountered numerous colonies on vertical granite cliffs. Here the plant was quite common. It appeared to be restricted to small recesses under small overhangs hardly more than a few centimeters deep, never out on the massive vertical exposures. Although usually growing in pure stands, single strands of branches occasionally arise from tufts of other mosses.

My main purpose in writing this note is to alert collectors in the Rocky Mountain region to the easy field recognition of this unique moss. Find massive north-facing granite outcrops with horizontal cracks, especially those that support such things as *Fabronia, Neckera,* and *Amphidium*, and I predict that *Leptopterigynandrum* will disappear from the ranks of extremely rare species.

I do not believe that there is justification for including *Leptopterigynandrum* in the Leskeaceae and suggest that it fits more naturally in the Pterigynandraceae. It was placed in the Leskeaceae at a time before the family was broken up into several segregates, and in all the characters that I have observed, it fits much better elsewhere according to modern familial concepts.

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Native Moss Names in Mexico

Claudio Delgadillo M.

Mosses rarely have names among present day Spanish speaking Mexicans. Laymen may simply refer to them by the generic words “musgo” (moss), “lama” (slime) or may even lack an identifying term for this group of plants. However, there is evidence that at least some ethnic groups in various parts of Mexico have developed a nomenclature for mosses.

About 20 years ago, I was introduced to Mr. Aexl Ramírez, a student working on a linguistic project in San Francisco Ixquihuacán, in the state of Puebla. While gathering information for vascular plants Mr. Ramírez became interested in the degree of awareness of other plant groups by the people in the area. He trained an informant, Mr. Anastacio E. Flores, to collect specimens and field information for vascular plants, and for mosses, at a later time. The collections were brought to me for identification; they included a náhuatl name and the Spanish translation provided by the collector. For unknown reasons, the collector was unable to provide additional sets of specimens to confirm the náhuatl names, and the link with Mr. Ramírez was broken. This article intends to rescue his preliminary contribution and introduce additional data from other sources.

In the course of fieldwork, I have obtained few additional moss names in several states in Mexico. Also, specimens received in exchange at MEXU include occasional reference to a local name. These have been compiled in the list below. The local name is followed by the language or dialect in which it was obtained, the Spanish name provided by the collector, an approximate literal English translation, and the scientific name, habitat, and locality - when available - for each supporting specimen. All materials are deposited at MEXU.

Barbita de Viejo, Spanish, [Old man’s beard”]. *Papillaria nigrescens* (Hedw.) Jaeg. – Sobre tronco de árbol, lugares expuestos y secos. CAMPECHE: 8 km W de Xpujil, Zona Arqueológica de Chicaná, 18° 29’ N – 89° 39’ W, Delgadillo 4423, Nov. 30, 1981.

Bzhàazh-nguiè, Zapoteco, A translation is not available. Braunia secunda (Hook.) B.S.G. – Growing on rock in sun, with Mammillaria sp., cactus; used for ornament. OAXACA: Distr. Miahuatlán, Mpio. San Juan Mixtepec, at bridge east of town en route San Pedro Mixtepec, 2000 m elev., 16° 17’ N – 96° 17’ W, E. Hunn OAX-1206, June 11, 1997.

Instituto de Biología, UNAM, Apartado Postal 70-233, 04510 México, D.F. MEXICO

Bopash, Náhuatl, "Pelo de los árboles" ["Trees hair"]. *Tortula amphidiacea* (C.M.) Broth., *Sphaerotheciella pinnata* (B.S.G.) Manuel – PUEBLA: San Francisco Ixquihuacán, A.E. Flores M3, Feb. 1, 1979.

Flor de Piedra, Spanish, ["Stone flower"]. *Entodontopsis leucostega* (Brid.) Buck & Irel. Rocas volcánicas. NAYARIT: Mpio. San Blas, El Rastro, Km 3 carretera San Blas-Tepic, J.I. Valdez 41, Sept. 20, 1996. Sobre suelo, lugares expuestos y secos. MICHOACÁN: Victoria de Cortazar, 20° 20' N – 101° 02' W, M. Vivas 327, Mayo 2, 1981.

Ipachllolima, Náhuatl, "Pelosa de lima" ["Lime hair"]. *Brachymenium spirifolium* (C.M.) Jaeg. – Epífita. PUEBLA: San Francisco Ixquihuacán, A.E. Flores 515 TIK, Sept. 20, 1977.

Limpach, Náhuatl, "Pelosa de lima" ["Lime hair"]. *Cryphaea patens* – Epífita. PUEBLA: San Francisco Ixquihuacán, A.E. Flores 517 TIK, Sept. 20, 1977.

Popachxi, Náhuatl, "Pelosa de árbol" ["Tree hair"]. *Papillaria deppei* – PUEBLA: San Francisco Ixquihuacán, A.E. Flores 499 TIK.

Puñic, Popoluca, "Musgo" ["moss"]. *Racopilum tomentosum* (Hedw.) Brid. – Wet rocks in spray of the falls. VERACRUZ: Canyon below Txolo Falls, south of Coatepec, 19° 25' N – 96° 55' W, H.W. Rickett 59, Aug. 31, 1943.

Ré eke bowara, Tarahumara, "Bigote de Piedra" ["Rock mustache"]. *Braunia secunda* (Hook.) B.S.G. – Rocks. CHIHUAHUA: Mpio. Guachochic, N of Humira, R. Bye 6208, Jan. 1974. On rock. CHIHUAHUA: Mpio. Guachochic, Tejaban, S of Cusarare, R. Bye 5506, Oct. 22, 1973. moss is cooked in water, then used as a wash for the head when one has a headache.

Shakuwaki, Totonaco, "Musgo" ["Moss"]. *Entodon beyrichii* (Schwaegr.) C.M., *Herpetineuron toccoae* (Sull. & Lesq.) Card., *Pterobryopsis mexicana* (Schimp.) Fleisch. – Epífita. PUEBLA: Tlayehualancingo, M. Sánchez 101, Enero 29, 1979.

Tecata, general name for mosses in the area of Capécuaro, Michoacán (C. Delgadillo M., Dec. 2, 1994).

Tipach, Náhuatl, "Pelosa de piedra" ["Rock hair"]. *Brachythecium plumosum* (Hedw.) B.S.G. – Sobre piedra. PUEBLA: San Francisco Ixquihuacán, A.E. Flores M1, Feb. 1, 1979; *Bryum argenteum* Hedw. – Suelo húmedo. PUEBLA: San Francisco Ixquihuacán, A.E. Flores 516 TIK, Sept. 20, 1977.

Tizonpach, Náhuatl, "Pelosa de peña" ["Rock hair"]. *Entodon beyrichii* (Schwaegr.) C.M. – PUEBLA: San Francisco Ixquihuacán, A.E. Flores 519 TIK, Sept. 20, 1977.

According to notes left by Mr. Ramírez, the Náhuatl word "Pashtli" means "moss" even though the collector translated it as "hair" or the distorted Spanish word “pelosa”. The names from the state of Puebla may then indicate that the inhabitants of San Francisco Ixquihuacán have acquired the term “moss” as a concept, but the informant failed to provide the adequate Spanish translation. Such Náhuatl words as “Tipash” may be given a free interpretation as “moss growing on rock” [ti-, rock; pash, moss], “Bopash”, “moss growing on tree”; and “Atipash”, “moss growing on rocks in the water”. A second informant indicated that the association of “Pashtli” to other words, resulted in a more precise meaning. Thus, for instance, “Bopash pashtli” may be freely translated as “moss growing on tree” and “Ocotl pashtli”, as “moss growing on a pine tree”. “Tipach pashtli” refers to a “moss growing on rock”; “Tison tipach pashtli” is the moss growing on a volcanic rock.

Although the linguistic variants cannot be explained, it is evident that moss nomenclature in Puebla and elsewhere in Mexico is not equivalent to the taxonomic concept in modern scientific literature. A moss name in a local dialect makes reference to the habitat or other peculiarities. The name “Old man’s beard” for *Papillaria nigrescens* certainly refers to the growth habit. De la Cruz (1552) introduced the names “Teamoxtli” (rock-inhabiting moss) and “Tepitoton teamoxtli” for mosses used in the treatment of various illnesses, which have the same nomenclatural basis.

Recent work in the Lacandon forest of Chiapas produced several names that are applied to mosses according to their habitat. These were provided by bilingual guides in Lacanjá, 16° 45’ N – 91° 07’ W, and in Laguna El Suspiro, 16° 45’ N – 91° 20’ W.

Kushem-tunich, Mayan, “atached to a rock”
Much-I-ché, Mayan, “attached to trees”
Kuc-ché, Mayan, “serving as a nest for something”
Ushushem-ché, Mayan, “living attached to trees”
Tsot-zé, Tzeltal, “moss”.

Acknowledgments. Thanks are extended to Mr. Axel Ramírez, formerly with Centro de Investigaciones Superiores, Instituto Nacional de Antropología e Historia, for specimens and linguistic data; Angeles Cárdenas and Israel Ramírez assisted with herbarium and database information. Robert Magill revised the text and provided useful criticism.

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Trichostomum arcticum Kaal. (Pottiaceae) new to the Province of Ontario, Canada

P. M. Eckel

The Tundra Region of Ontario is a "treeless band, up to 30 km broad, of open peatland along the coast of Hudson Bay" (Ireland & Ley 1992). Mosses and lichens often predominate in mats associated with low, woody plants including various species of willow (*Salix* spp.), *Dryas integrifolia* Vahl., *Rhododendron groenlandicum* (Oeder) Kron & Judd and *Ledum decumbens* (Ait.) Lodd. Ireland and Ley (1992) divide the Ontario moss flora into six categories, one of which includes taxa that have a northern affinity-presumably not strictly arctic-alpine, but including the extensive Boreal Forest Region. This area is characterized by black spruce muskeg and tamarack bogs in its northern extent and grades southward into predominately coniferous forest of spruce, fir, tamarack and jack pine. Eight percent (40 species) of the total moss flora of the Province occurs here. This northern group is predominantly species in *Dicranum*, *Drepanocladus* and especially *Sphagnum*. Only *Desmatodon cernuus* (Hueb.) BSG and *D. heimii* var. *arctica* (Lindb.) Crum represent species in the Pottiaceae (Ireland & Ley 1992).

While determining the distinctiveness and distribution of *Tortella arctica* (Arnell) Crundw. & Nyh. in North America, I found a specimen from CANM determined as that species from the tundra region of Ontario, at the southern extreme of the tree line boundary. *Tortella arctica* is a species apparently restricted to wet borders of the Arctic Ocean and in alpine tundra in the western Cordillera of North America.

Tortella arctica did not appear in Ireland and Cain's (1975) moss checklist of Ontario, nor in the atlas of Ontario mosses by Ireland and Ley (1992). However the range of *Tortella tortuosa* (Hedw.) Limpr. in a map prepared by those authors appears to reach its northern limit in the southern Boreal Forest zone with a single disjunct population on the tundra on the southern coast of Hudson Bay. This station corresponds exactly with that of the specimen of *Tortella arctica* (a taxon often cited as a variety of *T. tortuosa* var. *arctica* (Arn.) Broth.) from CANM, just mentioned. Presumably this specimen corresponds to the citation of *T. arctica* for Ontario in the most recent checklist of the mosses of Canada (Ireland et al. 1987).

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That specimen is here redetermined to be *Trichostomum arcticum* Kaal., new to the Ontario provincial flora. *Tortella arctica* is, then, provisionally excluded from the flora of Ontario although it is to be anticipated, it is not reported for Ontario in recent treatments of the genus *Tortella* in North America (Eckel 1998; Zander 1999).

Trichostomum arcticum Kaal. CANADA, Ontario. Kenora District: Polar Bear Provincial Park, SE of site 416, ca. 54°47' N, 82°18'W, 4 August 1978, H. Williams 4005 (CANM).

Both *Trichostomum arcticum* and *Tortella arctica* may be brick red to orangish yellow and occur in similar wet substrates. The leaves are recurved, but in *To. arctica* the limb of the leaf is reflexed from the top of the leaf base. Those of *Tr. arcticum* are recurved from the bottom of the leaf base, the leaf profile is one of a strong, more or less continuous arc. The basal cells of both species are thick-walled but the basal marginal cells of *Tr. arcticum* are short, quadrate, thick-walled to colenchymatous, rather than long, thin-walled and lax in *To. arctica*, hence the basal region does not rise up the edge of the leaf at an angle to the costa as in the genus *Tortella*. Furthermore, the leaf apex of *Tr. arcticum* is somewhat peculiar: as the leaf narrows toward the apex, it often becomes shallowly constricted somewhat before the tip, forming a triangle before finally terminating in the excurrent costa. *Tortella arctica* is distinctive in that its leaves are aggregated into a very distinct comal tuft at the stem apex; there is, however, no particular aggregation of leaves at the apex of the stem in *Tr. arcticum. Tortella arctica* and *To. tortuosa* are both tomentose; lack of tomentum is a characteristic of *Tr. arcticum*. The definitive character of *Trichostomum arcticum*, however, is the presence of a strong, well-defined stem central strand. The only North American species of *Tortella* to exhibit this feature occur in the temperate to subtropical zones (*To. humilis* (Hedw.) Jenn. and *To. flavovirens* (Bruch in F. Muell.) Broth.).

Trichostomum arcticum is distributed throughout the arctic regions of the various provinces and territories: northern British Columbia, Quebec, Labrador, Newfoundland, the Yukon, Northwest Territory and the Arctic Archipelago (Crundwell & Nyholm 1963; Ireland et al. 1987). The worldwide distribution of this species includes Svalbard, arctic Scandinavia, and northern and arctic Asiatic regions of the old USSR (Steere 1978) and western China (Crundwell & Nyholm 1963). The North American distribution of this species has been mapped by Schofield (1972); that of its world distribution by Abramova and Abramov (1966) and Kuc (1969). Other species of *Trichostomum* that occur in the arctic region of North America include *Tr. crispulum* Bruch ex F. Müll. and *Tr. recurvifolium* (Tayl.) Zand., both of which have obtuse, not acute leaves. Those which possess leaves with acute apices include *Tr. arcticum*, with its strong central strand, and *Tr. tenuirostris*, whose central strand is weak or absent (Zander 1999). Ireland and Cain (1975) give two other species of *Trichostomum* for Ontario: *Tr. spirale* Grout, and *Tr. tenuirostre* (Hook. & Tayl.) Lindb., occurring in the Deciduous (Carolinian) Forest Region, or the Great Lakes-St. Lawrence Forest Regions of southern Ontario (Ireland & Cain 1975); note the Ontario distribution of *Tr. tenuirostre* is given in a combination with *Oxystegus* by Ireland and Ley (1992). The present collection of *Trichostomum arcticum* is from the Tundra Region near Hudson Bay, and is a plant of strictly northern (arctic-alpine) affinity.

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Topeliopsis toensbergii (Lichens, Thelotremataceae) new to Canada

Othmar Breuss

The lichen genus *Topeliopsis* was recently described to accomodate thelotrematacean lichens with sessile, perithecioid apothecia with a cupular excipulum, distinct periphyses, and large, thin-walled, muriform ascospores which turn reddish in iodine (Kantvilas & Vezda 2000). For the present, the genus consists of three species, two of which were described from Tasmania, one of them also being known from New Zealand. The third species, *T. toensbergii*, was described from a single locality in Washington´s Olympic National Park. The illustrations provided by Kantvilas & Vezda (2000) brought to my mind an undetermined lichen specimen collected during the IMC5 Lichen Field Trip to Vancouver Island in 1994. A reexamination of this collection revealed that it was referable to *Topeliopsis*, its morphological and anatomical features matching perfectly the description of *T. toensbergii*. This species is herewith reported as new to Canada.

Topeliopsis toensbergii Vezda & Kantvilas, Lichenologist 32: 353 (2000).
Specimen: Canada, British Columbia, Vancouver Island, reserve of the Bamfield Marine Station, on stem of *Thuja plicata*, 29.8.1994 *O. Breuss 10.928* (LI).

The inconspicuous, very thin, whitish thallus is on bark or over bryophytes thereon. The sessile apothecia are subglobose, less than 0.5 mm broad, and have dark gray, somewhat erose, more or less distinctly fissured margins and open with a small, white-rimmed, denticulate apical pore. The paraphyses are simple and straight. The cylindrical asci contain two spores that are strongly muriform and up to 100 x 30 µm large.

The Canadian sample was found under similar ecological conditions as the type collection, as an epiphyte in west coast rain forest. Bamfield Marine Station is a remote research station on the west coast of Vancouver Island. The climate is oceanic in the strict sense. The vegetation is a true temperate rain forest in the hypermaritime subzone of the Coastal Western Hemlock Zone. Although yet known only from two localities, *Topeliopsis toensbergii* can be assumed to represent an element of the Pacific Northwest of North America.

Acknowledgement: I wish to thank the leaders of the IMC5 Lichen Field Trip 1994, Irwin M. Brodo and Trevor Goward, for wonderful experiences in lichen-rich habitats.

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State and County Moss Records for Arkansas III

Piers Majestyk

Abstract. *New distributional records of mosses are given for 18 counties in Arkansas.* Didymodon rigidulus *Hedw., and* Hygroamblystegium noterophilum *(Sull. & Lesq.* in *Sull.) Warnst. are reported new to the state.*

A total of 103 county records, two of which are state records, have been identified from 18 Arkansas counties. Voucher specimens of all species collected are deposited in the herbarium of Henderson State University (HEND). Nomenclature for the most part follows that of Anderson (1990) and Anderson et al. (1990). New state records are identified with an asterisk (*). County names are in boldface and collection numbers are underlined for each record. For additional references concerning distributional records of Arkansas mosses consult Majestyk (1994, 1995) and Redfearn (1999).

AMBLYSTEGIACEAE
Amblystegium serpens var. *juratzkanum* (Schimp.) Rau & Herv. – **Van Buren**: 1641.
A. varium (Hedw.) Lindb. – **Baxter**: 1718.5.
Campylium hispidulum (Brid.) Mitt. – **Dallas**: 1356; **Van Buren**: 1642.
Hygroamblystegium noterophilum* (Sull. & Lesq.) Warnst. – **Stone: 1469.
Leptodictyum riparium (Hedw.) Warnst. – **Cleveland**: 1375.
Platylomella lescurii (Sull. *in* Gray) Andrews – **Perry**: 1590.
ANOMODONTACEAE
Anomodon attenuatus (Hedw) Hüb. – **Dallas**: 1357; **Perry**: 1596; **Yell**: 1793.
A. minor (Hedw.) Fürnr. – **Nevada**: 1915; **Van Buren**: 1635.
A. rostratus (Hedw.) Schimp. – **Van Buren**: 1637.
AULACOMNIACEAE
Aulacomnium heterostichum (Hedw.) B.S.G. – **Yell**: 1797.
A. palustre (Hedw.) Schwaegr. – **Calhoun**: 1397.5.
BARTRAMIACEAE
Philonotis fontana var. *cespitosa* (Jur.) Schimp. – **Hot Spring**: 1527.
BRACHYTHECIACEAE
Brachythecium acuminatum (Hedw.) Aust. – **Baxter**: 1695; **Conway**: 1606; **Pope**: 1729.
B. laetum (Brid.) B.S.G. – **Dallas**: 1358; **Hot Spring**: 1526.
B. salebrosum (Web. & Mohr) B.S.G. – **Baxter**: 1702.
Bryoandersonia illecebra (Hedw.) Robins. **Bradley**: 1386; **Nevada**: 1927.

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Eurhynchium hians (Hedw.) Sande-Lac. – **Calhoun**: 1388; **Hot Spring**: 1489.
E. pulchellum (Hedw.) Jenn. – **Grant:** 1872; **Hot Spring**: 1473.
Steerecleus serrulatus (Hedw.) Robins. – **Cleveland**: 1378.
BRYACEAE
Bryum dichotomum Hedw. – **Baxter**: 1714.
BRUCHIACEAE
Trematodon longicollis Michx. – **Hempstead**: 1958.
CLIMACIACEAE
Climacium americanum Brid. – **Hot Spring**: 1469.
DICRANACEAE
Campylopus talluensis Sull. & Lesq. – **Calhoun**: 1395; **Hot Spring**: 1518; **Pope**: 1756.
Dicranella heteromalla (Hedw.) Schimp. – **Baxter**: 1701; **Bradley**: 1381; **Cleveland**: 1371; **Dallas**: 1364; **Nevada**: 1941.
Dicranum scoparium Hedw. – **Grant**: 1910.
ENTODONTACEAE
Entodon macropodus (Hedw.) C.Müll. – **Hot Spring**: 1461.
E. seductrix (Hedw.) C. Müll. – **Bradley**: 1382; **Cleveland**: 1369; **Perry**: 1597; **Van Buren**: 1620.
FABRONIACEAE
Clasmatodon parvulus (Hampe) Hook. & Wils. – **Bradley**: 1387.
FISSIDENTACEAE
Fissidens bushii (Card. & Thér.) Card. & Thér. – **Cleveland**: 1365; **Yell**: 1787.
F. ravenellii Sull. – **Pope**: 1766.
FONTINALACEAE
Fontinalis flaccida Ren. & Card. – **Hot Spring**: 1516.
FUNARIACEAE
Funaria hygrometrica Hedw. – **Perry**: 1580.
GRIMMIACEAE
Grimmia pilifera P.-Beauv. – **Van Buren**: 1646.
Schistidium apocarpum (Hedw.) Bruch & Schimp. – **Cleveland**: 1370; **Conway**: 1607; **Hot Spring**: 1464; **Van Buren**: 1623.
S. rivulare (Brid.) Podp. – **Perry**: 1599.
HEDWIGIACEAE
Hedwigia ciliata (Hedw.) P.-Beauv. – **Hempstead**: 1956.
HYPNACEAE
Homomallium adnatum (Hedw.) Broth. – **Searcy**: 1720; **Van Buren**: 1646.5.
Hypnum lindbergii Mitt. – **Calhoun**: 1390.
Isopterygium tenerum (Sw.) Mitt. – **Cleveland**: 1373; **Perry**: 1578; **Washington**: 1867.
Platygyrium repens (Brid.) B.S.G. – **Perry:** 1585.
Pylaisiella selwynii (Kindb.) Crum, Steere & Anderson – **Pope**: 1744.

LESKEACEAE

Haplocladium microphyllum (Hedw.) Broth. – **Baxter**: 1715; **Cleveland**: 1367; **Hot Spring**: 1471; **Pope**: 1732.

Haplocladium virginianum (Brid.) Broth. – **Nevada**: 1918.

Leskea australis Sharp – **Van Buren**: 1643.

Lindbergia brachyptera (Mitt.) Kindb. – **Grant**: 1873.

LEUCOBRYACEAE

Leucobryum albidum (Brid. ex P.-Beauv.) Lindb. – **Perry**: 1579.

LEUCODONTACEAE

Leucodon julaceus (Hedw.) Sull. – **Bradley**: 1384; **Cleveland**: 1366.

MNIACEAE

Plagiomnium cuspidatum (Hedw.) T. Kop. – **Calhoun**: 1389.

ORTHOTRICHACEAE

Orthotrichum pusillum Mitt. – **Conway**: 1616.

O. stellatum Brid. – **Washington**: 1869.

POLYTRICHACEAE

Atrichum angustatum (Brid.) B.S.G. – **Cleveland**: 1368; **Yell**: 1798.

Polytrichum commune Hedw. – **Cleveland**: 1374; **Grant**: 1895.

P. ohioense Ren. & Card. – **Baxter**: 1580; **Grant**: 1911.

POTTIACEAE

Barbula indica (Hook.) Spreng. In Steud. – **Washington**: 1866.

Desmatodon plinthobius Sull. & Lesq. – **Saline**: 1574.

Didymodon rigidulus* Hedw. – **Pope: 1737.

Tortella humilis (Hedw.) Jenn. – **Cleveland**: 1377; **Dallas**: 1361.

Weissia controversa Hedw. **Bradley**: 1383; **Cleveland**: 1383; **Grant**: 1908; **Perry**: 1589; **Van Buren**: 1617.

W. jamaicensis (Mitt.) Grout – **Baxter**: 1708.

PTYCHOMITRIACEAE

Ptychomitrium sinense (Mitt.) Jaeg. – **Pope**: 1757.

SEMATOPHYLLACEAE

Sematophyllum adnatum (Michx.) E.G. Britt. – **Baxter**: 1697; **Cleveland**: 1379.

SPHAGNACEAE

Sphagnum palustre L. – **Calhoun**: 1396.

THELIACEAE

Thelia hirtella (Hedw.) Sull. – **Cleveland**: 1376.

THUIDIACEAE

Thuidium delicatulum (Hedw.) Schimp. – **Bradley**: 1385.

Acknowledgments. I thank Dr. Bill Buck, Dr. Paul Redfearn and Dr. William Reese for assistance in correcting and confirming several of the above identifications.

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A new Alberta and second Canadian record for *Orthotrichum hallii*

Roxanne I. Hastings

Orthotrichum hallii Sull. & Lesq. in Sull. is known to be "endemic to the dryer regions of the Southern Rocky Mountains and the smaller mountain ranges of Arizona, New Mexico, Nevada, Utah, southern Idaho, Wyoming, and Colorado" (Vitt 1973). Until now, the only Canadian record for *O. hallii* had been from near Lytton, in the Fraser River valley of southern British Columbia (Schofield and Sharp 26017 UBC). In the United States, *O. hallii* is usually found on calcareous sandstones and limestone, but occasionally it can be found on granites and quartzites. It is known to prefer cliff faces (Vitt 1973).

While mapping the distributions of *Coscinodon calyptratus* (Hook. in Drum.) Kindb. and *Coscinodon cribrosus* (Hedw.) Spruce in North America from herbarium specimens, for my taxonomic research on the genus (Hastings 1999), I became intrigued by the locations of these two species in Alberta. In Kananaskis Country, in the front ranges of the Rocky Mountains west of Calgary, there were five sites for *C. calyptratus* and two for *C. cribrosus*. Like all members of the genus these two species are strongly acidophilic, yet the bedrock of the front ranges in this region is calcareous limestones and sandstones. This would seem to be good habitat for a calciphilic *Orthotrichum*, i.e. *O. hallii*, which had never been collected in the province, but poor habitat for *Coscinodon*.

While investigating the locations of *Coscinodon* in the Kananaskis area, a chance meeting in the field with G. Ross of the Geological Survey of Canada revealed that there were three bands of acidic conglomerate running from near the Montana-Alberta border to the Grande Cache region in west central Alberta. In the few days we had available to us, we focused on collecting Grimmiaceae and *Orthotrichum* from these conglomerates where they outcropped in Kananaskis. As these conglomerates are more resistant to erosion than the surrounding sandstones and limestones, they form cliff faces and tend to be near the tops of exposures, often being ridgetops. However, due to a significant overthrust fault in one location, the conglomerates were overtopped by a massive section of calcareous bedrock. As we were collecting specimens in a rainstorm, we were able to observe that the overlying calcareous sediments were being eroded out over the conglomerates that were forming a cliff face at the base of the section.

It was on a south-facing conglomerate exposure that was being washed over by calcareous sediments that we collected *Orthotrichum hallii*. The specimen caught

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my eye as I had collected the species on several occasions in the American southwest while collecting *Grimmia*. This is the first collection of *O. hallii* from Alberta and only the second Canadian record. Although it was surprising to collect the species on acidic conglomerate, the calcareous outwash was apparently creating a buffer. Collecting *O. hallii* on a normally dry, south-facing cliff face in a montane pine woodland was where one would expect to find the species.

In the lab the specimen was identified as *O. hallii* by: 1) bistratose leaves with low conical papillae, 2) leaf margins not thickened, 3) emergent, eight-ribbed capsules, and 4) peristome of eight whitish colored teeth. The low, conical papillae, and bistratose lamina separated the specimen from *O. jamesianum* Sull. ex James in Watson which also grows in the area. The latter species has larger and forked papillae and unistratose lamina. Dale Vitt kindly verified the identification of the specimen as *O. hallii.*

> Alberta: Kananaskis Country. Sibbald Flats Road, highway 68, east of junction with Kananaskis highway 40. 51° 03' 07" N, 114° 57' 02" W, 1520 m. Drip zone on conglomerate outcrop overtopped by calcareous bedrock. Hastings, R.I., 4 July 2000 C00.4.12 (PMAE).

Acknowledgments: The author wishes to thank Robert Blaxley and Donna Cherniawsky for their enthusiastic assistance in the field, Gerry Ross for informing the author of the existence of the acidic conglomerates, and Dale Vitt for verifying the identity of the specimen. The Kananaskis Centre for Environmental Research provided accommodations for the author and her field crew.

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Two Mosses new for North America with Southern Hemisphere Affinities

James R. Shevock

In the course of developing a specimen-based catalogue of California mosses (Norris & Shevock in prep.), two taxa proved not only new to California, but also represent the first occurrence documented for North America. *Atractylocarpus flagellaceus* (C. Müll.) Williams and *Zygodon menziesii* (Schwaegr.) Arnott are hereby reported as new for North America. Both species have distribution patterns associated with the Southern Hemisphere.

Atractylocarpus flagellaceus (C. Müll.) Williams [=*Campylopodiella flagellacea* (C. Müll.) Frahm & Isoviita] Dicranaceae

California: Trinity Co.: Along highway 299 adjacent to Trinity River, 0.25 miles west of road junction to Old Helena, Trinity Mountains, Shasta-Trinity National Forest, 20 Oct 1998, 40° 46' 00" N, 123° 07' 40" W., 1300 ft., *Shevock, Lin & Chen 17441* (BONN, CAS, DUKE, MO, NY, UC). Common on seep of road bank with *Mielichhoferia elongata.*

This collection was first placed within the genus *Campylopodiella* by Bruce Allen (MO) and subsequently determined to this species by Jan-Peter Frahm (BONN). Distribution: known from Mexico, Guatemala, Panama, Venezuela, Columbia and Bolivia (Sharp, Crum & Eckel 1994). Since this population of *Atractylocarpus flagellaceus* is associated with *Mielichhoferia elongata,* a species that appears to be restricted in California to metamorphic road banks, this could represent a disjunct introduction. Nonetheless, it is an unexpected addition to the California bryoflora and to North America.

Zygodon menziesii (Schwaegr.) Arnott Orthotrichaceae

California: San Francisco Co.: Panhandle section of Golden Gate Park, on the base and trunk of large *Eucalyptus globulus* trees, 1 Jan 2000, 37° 46' 20"N, 122° 26' 55"W, 250 ft., *Shevock 18773* (ALTA, CAS, MO, UC) & 27 Feb 2000, *Toren 7707* (CAS); Jefferson Park, on *Eucalyptus globulus*, 5 Feb 2000, 37° 46' 53"N, 122° 25' 35"W., 200 ft., *Shevock 18901* (ALTA, CAS, NY, UC); Diamond Heights, Duncan Street and Cameo Way, on trunk of *Myoporum* sp., 1 Jul 2000, 37 ° 44' 45" N, 122 °26' 35" W, 650 ft., *Toren 8159* (CAS).

National Park Service, Pacific West Region, San Francisco, California 94107-1372

Specimen determinations confirmed by Dale Vitt. Distribution: known from Australia, Tasmania, New Zealand and Chile (Catcheside 1980 & Sainsbury 1955). The occurrence of *Zygodon menziesii* in California is probably a relatively recent introduction. Non-native *Eucalyptus* forests was planted in San Francisco starting back in the 1880s. Two of the three occurrences were recorded at the base of large *Eucalyptus* trees about 100 years old. This species should be expected in neighboring California coastal counties with extensive *Eucalyptus* forests.

New moss additions to landscapes at the continental scale are yet another clear indication that much bryological field collecting and floristic studies remain for much of California and the western United States.

Acknowledgments. Special thanks to Drs. Bruce Allen, Jan-Peter Frahm and Dale Vitt for their assistance in examining these collections and providing determinations and or confirmations.

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***Lunularia cruciata* (Lunulariaceae) Growing Outdoors In New York State -- An Update**

Norman Trigoboff

Lunularia cruciata (L.) Dum. is a large, thalloid liverwort that is a common weed in greenhouses. Earlier this year, I reported *L. cruciata* growing outdoors in a somewhat sheltered site, on the Cornell University Campus in Ithaca, N.Y. (Trigoboff, 2000).

Lunularia cruciata also grows outdoors at three other places at Cornell: the east side of Sage Chapel (*Trigoboff, c003*); the north side of Day Hall (*c004*); and the north side of Warren Hall -- here as female plants (*c006*). All the plants are within 0.5 m of a building or concrete wall, on lawns and in the narrow zone of herbicide-produced bare ground around buildings. None of the plants is near an existing greenhouse.

Lunularia cruciata also grows outdoors at the former site of Rice's Nursery, in Homer, N.Y.: on raised, bare ground by a footpath between where the southeast greenhouse stood and the owner's house (*c0021*); on bare ground and under grass, on a 1 m wide path between the northwest greenhouse and the garage (*c0023*); and on the ground where the southeast greenhouse stood (*c0020*). The southeast greenhouse was taken down within the last year and some of the *L. cruciata* there has died, though some looks as if it will persist. *L. cruciata* was also present in the northwest greenhouse, which was in the process of being dismantled (*c0022*). All the plants were within a 20 m radius. Rice's Nursery, which specialized in orchids, started in the early 1950s and is now out of business. The *L. cruciata* there has been abundant indoors, at least since 1983 (*c8320*).

Rice's two greenhouses had hard-packed gravel and dirt floors suitable for the growth of *Lunularia cruciata*. Cornell's greenhouses currently have concrete and loosely-packed gravel floors, with no *L. cruciata*. *Lunularia cruciata* could spread when greenhouse plants are transferred outdoors; when old flower pots and dirt are dumped; and most likely, by gemmae temporarily adhering to footwear. A simple control measure, if needed, might be the placement of wood chips on footpaths and near buildings.

Lunularia cruciata may be expected outdoors, near suitable old and/or defunct greenhouses, especially on footpaths and near buildings, perhaps through much

Interfaith Center, 7 Calvert St., Cortland, NY 13045

of the continent. Other large thalloid liverworts, such as *Marchantia polymorpha* L. and *Preissia quadrata* (Scop.) Nees, may occur near buildings, but cannot be confused with *L. cruciata*, which has unique, lunate gemmae receptacles that are always present (Schuster, 1992).

Cited specimens have been deposited at BH.

Acknowledgements. I am grateful to Robert Dirig and Norton Miller for reading a draft of this article.

Literature Cited

Schuster, R. M. 1992. The Hepaticae and Anthocerotae of North America East of the Hundredth Meridian, Vol. 6. Chicago: Field Museum of Natural History.

Trigoboff, N. 2000. *Lunularia cruciata* (Lunulariaceae) growing outdoors In New York. EVANSIA 17(1): 6.

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EVANSIA

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The genera *Barbula* and *Didymodon* (Pottiaceae) in Maine

Bruce Allen

Typically *Barbula* species have triangular to lingulate leaves that are often stoutly mucronate, with strongly recurved leaf margins, two well-developed costal stereid bands, and long-cylindrical capsules with filamentous, spirally twisted peristome teeth. Gametophyte and sporophyte characters in the genus, however, vary in such a way that *Barbula* often grades into *Didymodon*. Indeed, the two genera intergrade so closely they are sometimes considered synonymous (see e.g., Smith 1978, Nyholm 1990, Frey & Kürschner 1991, Abramov & Volkova 1998). Saito (1975) distinguished the Japanese members of these genera by axillary hair features and the shape of the costal cells on the upper, ventral leaf surface: *Barbula* with axillary hairs hyaline throughout, costal cells short-rectangular to elongate; *Didymodon* with axillary hairs having brown basal cells, costal cells quadrate. Crum & Hall (1995) separated the genera on the basis of peristome form and axillary hair characters: *Barbula* with long, spirally twisted peristome teeth, axillary hairs hyaline throughout; *Didymodon* with short, erect peristome teeth, axillary hairs having brown basal cells. As the genera were treated by Zander (1993, 1998) it is impossible to avoid the terms "usually, mostly, or occasionally" for all of their sporophyte and gametophyte features except the axillary hair character.

In a general way *Barbula* differs from *Didymodon* in leaf shape (triangular to lingulate vs lanceolate to long-lanceolate), relative differentiation of the upper and lower leaf cells (strongly vs weakly), shape of the upper ventral costal cells (elongate vs quadrate), leaf papillae form (multiplex vs absent to simple) and peristome teeth form (long and spirally twisted vs short, erect to weakly twisted). The most recent world-wide evaluation of these genera (Zander 1993) accepts 122 species of *Didymodon* and 205 species of *Barbula*. In view of their size and the complex, reticulating manner in which their character states intergrade it is unrealistic to expect these genera to be anything other than amorphous.

The Pottiaceae are poorly represented in Maine and so the family is not too taxonomically difficult. The presence of leaves with two costal stereid bands, margins variously recurved, and firm-walled basal cells that gradually grade into the upper leaf cells, in combination with a stem central strand will separate *Barbula* and *Didymodon* from all other members of the family in the state. At present Maine has two *Barbula* species and one *Didymodon* species, and these are distinct enough that there is no need to rely on axillary hair evaluations in order to separate them.

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1. Leaves lanceolate to ovate-lanceolate, leaf cells with 1(2) low, blunt, inconspicuous papillae .... *Didymodon fallax*
1. Leaves oblong-lanceolate, leaf cells densely pluripapillose 2
    2. Leaf margins weakly recurved at base, apex rounded-obtuse to broadly acute, costa percurrent to subpercurrent; seta yellow .... *Barbula convoluta*
    2. Leaf margins revolute ½ to ¾ the leaf length, apex abruptly and stoutly apiculate, costa excurrent; seta red ...... *Barbula unguiculata*

Barbula Hedw., Sp. Musc. Frond. 115. 1801. *nom. cons.*

Hydrogonium (C. Müll.) Jaeg., Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1877-78. 405. 1880. *Trichostomum* sect. *Hydrogonium* C. Müll., Linnaea 40: 297. 1876. *Didymodon* subg. *Hydrogonium* (C. Müll.) Kindb., Eur. N. Amer. Bryin. 2: 273. 1897. *Barbula* subg. *Hydrogonium* (C. Müll.) Fleisch., Musci Buitenzorg 1: 352. 1904. *Barbula* sect. *Hydrogonium* (C. Müll.) Saito, J. Hattori Bot. Lab. 39: 492. 1975.

Semibarbula Herz. *ex* Hilp., Beih. Bot. Centralbl. 50: 626. 1933.

Plants small to medium-sized, yellow-green, green, dark-green, red, or brown above, brown to reddish brown below, in loose tufts or cushions. Stems erect, sparsely and irregularly branched, scleroderm and central strand present; rhizoids reddish-brown, sparse. Axillary hairs 5–8 cells long, all cells hyaline. Leaves triangular-, oblong-, or ovate-lanceolate, lanceolate, lingulate, ligulate, appressed-incurved, often twisted and contorted above when dry, often deeply grooved along the costa on upper ventral surface; rounded to obtusely acute, often mucronate; lamina unistratose; margins entire, at times denticulate at apex, usually recurved, occasionally plane; costa usually percurrent to excurrent as a short mucro, occasionally subpercurrent, ventral surface cells elongate, occasionally quadrate to short-rectangular, guide cells and two stereid bands well-developed, ventral surface layer of enlarged cells; upper cells quadrate, oblate or short-rectangular, firm-walled, pluripapillose, occasionally smooth, basal cells usually differentiated, enlarged, rectangular, walls thin or firm, at times porose, bulging, or short- to long-rectangular, hyaline, usually smooth, alar cells not differentiated. Asexual reproduction often by propagula on rhizoids or in leaf axils. Perichaetia terminal. Dioicous. Setae elongate, smooth. Capsules long-cylindrical; stomata present in neck; opercula long-conic; annuli well-developed; peristome teeth 32, filamentous, twisted counter-clockwise, basal membrane low. Calyptrae cucullate.

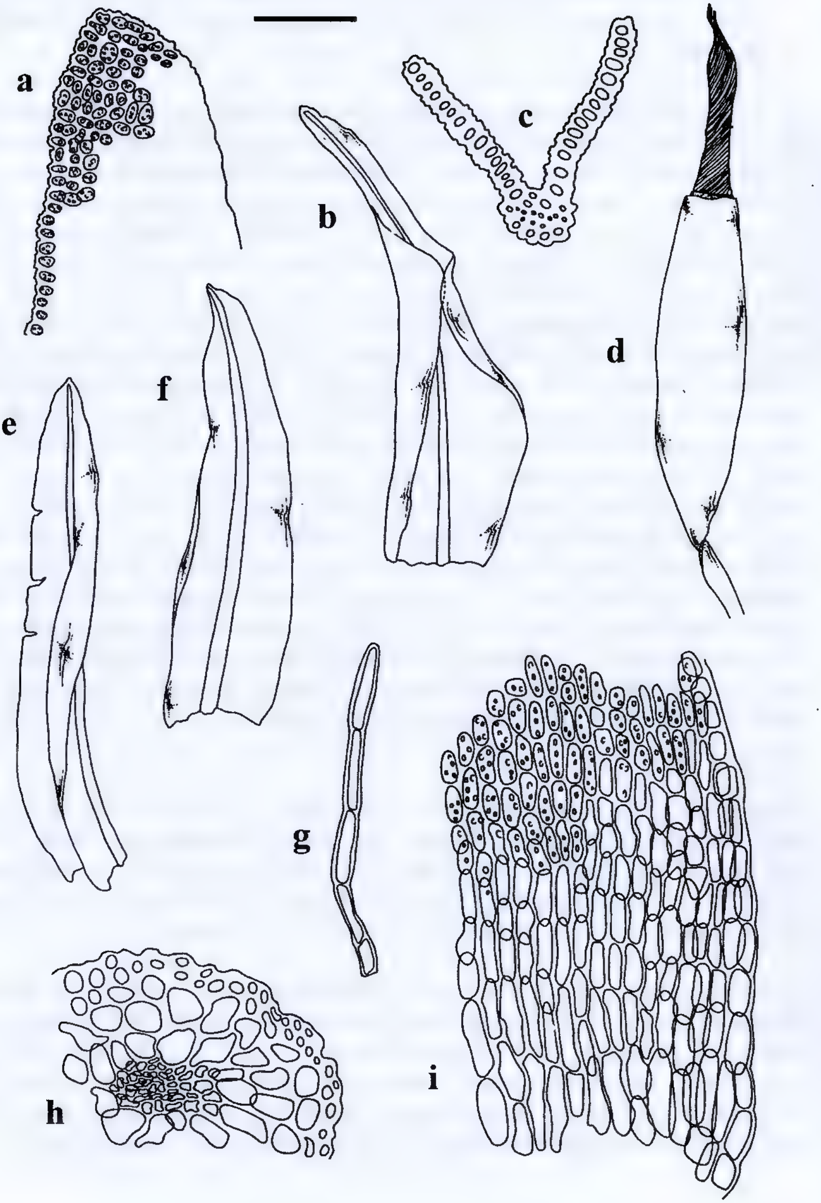
The name *Barbula* combines the Latin *barba* (beard) with the diminutive suffix -*ula* in reference to its long, spirally twisted peristome.

1. *Barbula convoluta* Hedw., Sp. Musc. Frond. 120. 1801.
Tortula convoluta (Hedw.) Gaertn., *et al.*, Oekon. Fl. Wetterau 3(2): 92. 1802. *Streblotrichum convolutum* (Hedw.) P.-Beauv., Prodr. Aethéogam. 89. 1805.

Plants small, yellow-green above, brown below, in tufts, 2–5 mm high. Stems red, erect, sclerodem and central strand present; irregularly branched; rhizoids distributed at base of stems, red, smooth. Axillary hairs 5–7 cells long, all cells hyaline. Leaves 1–1.6 mm long, oblong-ligulate to oblong-lanceolate, or lingulate, crowded on stem, erect-incurved, contorted or spirally twisted when dry, erect-spreading to spreading when wet, grooved along the costa on ventral surface, ventral surface cells elongate; rounded obtuse to broadly acute, not apiculate; lamina unistratose; margins entire, weakly recurved below, plane above; costa ending 6–8 cells below the apex, papillose at back on dorsal surface by simple papillae, guide cells well-developed, ventral stereid band absent or weakly developed, dorsal stereid band well-developed, ventral surface layer not enlarged; upper cells rounded quadrate, subquadrate, or oblate, 7–10 µm, firm-walled, densely pluripapillose by large, c-shaped papillae, inner basal cells oblong, short to long-rectangular, firm-walled, smooth, 20–40 µm x 8–16 µm, alar cells not differentiated. Dioicous. Perichaetia leaves convolute-sheathing, greatly enlarged. Setae smooth, 10–20 mm long, yellow to yellow-brown. Capsules cylindrical, erect, 1–2 mm long, smooth; stomata present in neck; opercula erect, long-rostrate, 1–1.5 mm long; exothecial cells short-rectangular, firm-walled; annuli well-developed, vesiculose; peristome red, basal membrane high, teeth spirally twisted, to 1 mm long, densely spiculose. Spores 6–8 µm, smooth. Calyptrae cucullate, smooth, to 2.0 mm long. n = 10, 11, 13, 14 (Fritsch 1991).

On soil bank, limestone rock, and on eroding edge of limestone kiln tailings. In Maine known from Aroostook (*Collins 792* FH), Cumberland (*Allen 20487* MO), Knox (*Ledlie 544* MO; *Spaulding 107* MO), and Piscataquis (*Hermann 19640* US) Counties. The species has been reported from Androscoggin (Parlin 1939), Oxford (Parlin 1939) and Washington (Spencer 1993) Counties.

Barbula convoluta is a widespread, northern hemispheric species. It often is yellowish-green in color, and has broadly rounded to obtuse leaves, percurrent to subpercurrent costae, leaf margins recurved only at the base, densely pluripapillose leaf cells, greatly enlarged, convolute-sheathing perichaetial leaves, and yellow setae. The presence of densely pluripapillose leaf cells in *B. convoluta* is sufficient to distinguish it from the genus *Didymodon* in Maine.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The species is more likely to be confused with *B. unguiculata* which is commonly found in disturbed habitats and so is more often encountered in the state. *Barbula unguiculata* is distinguished from *B. convoluta* by its abruptly apiculate leaves, excurrent costa, strongly recurved leaf margins and red setae.

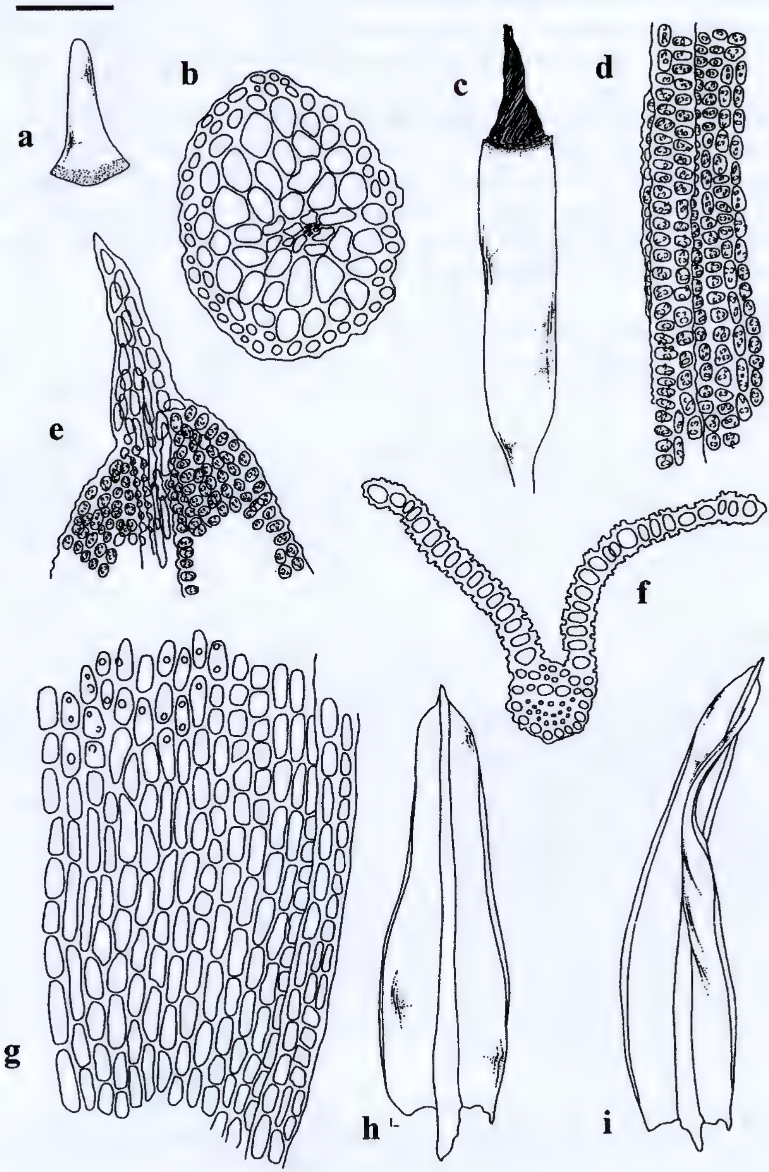
As with most members of the Pottiaceae *B. convoluta* is usually associated with calcareous habitats, e.g., in Knox County it is known from an old limestone quarry (Simonton Quarry Preserve) and an area of old lime kilns and lime slag heaps (Rockport Marine Park). Additional stations for the species in Maine should be looked for in such places. These extremely disturbed sites are often home to members of the Pottiaceae as well as Encalyptaceae.

2. *Barbula unguiculata* Hedw.

Tortula unguiculata (Hedw.) Roth & P. Beauv., Prodr. Aethéogam. 93. 1805.
Streblotrichum unguiculatum (Hedw.) Loeske, Stud. Morph. Syst. Laubm. 102. 1910.

Plants small, yellow-green or green above, brown below, in tufts, 1–10 mm high. Stems red, erect, scleroderm present, central strand well-developed; irregularly branched; rhizoids sparse at base of stems, red, smooth. Axillary hairs 5–7 cells long, all cells hyaline. Leaves 1–2 mm long, oblong-lanceolate from an ovate base, crowded on stem, erect, incurved-contorted when dry, erect-spreading when wet, grooved along the costa on ventral surface, ventral surface cells elongate; broadly acute, abruptly apiculate; lamina unistratose; margins entire, recurved in lower ½ to ⅔; costa shortly and stoutly excurrent, papillose at back, guide cells and two stereid bands present, ventral surface layer somewhat enlarged; upper cells rounded quadrate, subquadrate, oblate, or short-rectangular, 6–14 µm, firm-walled, densely pluripapillose by large, c-shaped papillae, inner basal cells oblong, short- or long-rectangular, firm-walled, smooth to lightly papillose, 10–36 µm x 6–10 µm, alar cells not differentiated. Dioicous. Perichaetia leaves not strongly differentiated. Setae smooth, 5–10 mm long, red. Capsules cylindrical, erect, 1–2 mm long, smooth; stomata present in neck; opercula erect, long-rostrate, with 5–6 rows of small rounded cells at base, upper cells long, narrowly rectangular and arranged in spiral rows, 1 mm long; exothecial cells short-rectangular, firm-walled; annuli not vesiculose; peristome red, basal membrane low, teeth spirally twisted, to 1.2 mm long, densely spiculose. Spores 8–12 µm, smooth. Calyptrae cucullate, smooth, to 2.0 mm long. n = 11, 12, 13, 14, 24 (Fritsch 1991).

Figure 1. *Barbula convoluta*. a. Leaf apex. b. Perichaetial leaf. c. Leaf cross-section. d. Capsule. e. & f. Leaves. g. Axillary hair. h. Stem cross-section. i. Basal leaf cells. Scale bar in mm: bar = 0.05 (a,c,g–i); bar = 0.28 (d); bar = 0.5 (b,e,f). All figures from *Gómez 21657* (MO).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On bare soil, river or stream banks, cliff crevices, roadsides, over boulders, cement sidewalks, and relic shell heaps. In Maine known from Androscoggin (*Allen 14676* MO), Aroostook (*Allen 16370* MO), Cumberland (*Allen 21853* MO), Franklin (*Allen 22629* MO), Kennebec (*Allen 21863* MO), Lincoln (*Allen 16646* MO), and Penobscot (*Merrill, Oct. 1898* FH) Counties. The species has been reported from Hancock County (Schnooberger & Wynne 1941).

Barbula unguiculata is a weedy moss likely to be a common species in the state. It occurs in disturbed, calcareous places, e.g., along concrete side walks or walls, roadsides, in old fields, and old campsites. As with *B. convoluta* the species can be yellow-green in color. It has oblong-lanceolate, abruptly apiculate leaves, firm, pluripapillose leaf cells, and strongly recurved leaf margins. Characters of special importance in recognizing the species include its two costal stereid bands, large c-shaped upper leaf papillae, and costa that is stoutly excurrent into the leaf apiculus.

Didymodon Hedw., Sp. Musc. Frond. 104. 1801.

Plants small, medium or robust-sized, yellow-green, green, dark-green, red, or brown above, brown to reddish brown below, in loose tufts or cushions. Stems erect, sparsely and irregularly branched, scleroderm present or absent, hyaloderm present or absent, central strand present or absent; rhizoids reddish-brown, sparse. Axillary hairs 3–7 cells long, basal 1–3 cells quadrate and brown, upper cells hyaline. Leaves triangular-ovate, oblong-, ovate-, or linear-lanceolate, lanceolate, lingulate, ovate, elliptic, erect-appressed, erect-incurved, at times contorted or circinate-contorted when dry, variously grooved along the costa on upper ventral surface; rounded to obtusely acute, acute, acuminate or subulate; lamina unistratose, at times bistratose at the margins; margins entire, at times crenulate by projecting cells, recurved, revolute or plane; costa subpercurrent, percurrent or excurrent, ventral surface cells quadrate or elongate, guide cells well-developed, ventral stereid cells present or absent, dorsal stereid cells present, ventral surface layer of enlarged cells present or absent; upper cells quadrate, rounded, oblate-triangular, or short-rectangular, firm-walled, pluripapillose, unipapillose or smooth, basal cells rounded, oblong, short- or long-rectangular, usually smooth, alar cells not differentiated. Asexual reproduction by propagula on rhizoids or in leaf axils. Dioicous. Perichaetia terminal. Setae elongate, smooth. Capsules cylindrical; stomata present in neck;

Figure 2. *Barbula unguiculata*. a. Operculum. b. Stem cross-section. c. Capsule. d. Leaf margin and cells at mid-leaf. e. Leaf apex. f. Leaf cross-section. g. Basal leaf cells. h. & i. Leaves. Scale bar in mm: bar = 0.05 (b,d–g); bar = 0.2 (h,i); bar = 0.6 (a,c). Figures b, d, e–i from *Allen 16646* (M), all other figures from *Allen 21853* (MO).

opercula long-conic to rostrate; annuli often well-developed; peristome teeth filamentous and twisted or short and erect, rudimentary, or absent, basal membrane low or absent. Calyptrae cucullate.

The genus *Didymodon* as treated by Zander (1993, 1998) is difficult to characterize because it is so variable in nearly all features. Saito (1975) considered the genus distinct on the basis of derived traits such as brownish basal cells of the axillary hairs, short cells on the upper ventral surface of the costa, and well defined laminal cells. Steere (1938, 1947) and Zander (1993) recognized four main evolutionary lines within *Didymodon* that correspond to the sections *Didymodon, Asteriscium* (C. Müll.) Zand., *Fallaces* Steere, and *Vineales* (Steere) Zand. Section *Asteriscium*, the most distinctive section, has species with the unusual features of a stem hyloderm, a single (dorsal) costal stereid band, and greatly enlarged, papillose cells on the upper ventral surface of the costa. This section is better recognized as the segregated genera *Husnotiella* Card. and *Trichostomopsis* Card.

The name *Didymodon* combines the Greek *didymos* (double, twin) and *odontos* (tooth) in reference to its divided peristome teeth.

Didymodon fallax (Hedw.) Zand., Phytologia 41: 28. 1978.
Barbula fallax Hedw., Sp. Musc. Frond. 120. 1801.

Plants small, dull, green to dark-green, at times red-brown above, brown below, in tufts, 2–5 mm high. Stems red, erect, not or sparsely and irregularly branched, scleroderm present, central strand well-developed; rhizoids sparse, at base of stems or scattered throughout. Axillary hairs 3–5 cells long, basal cell brown. Leaves 1.1–2.0 mm long, long-triangular to ovate-lanceolate, spreading at base, erect-incurved when dry, erect-spreading when wet, grooved with a narrow median channel along the costa on ventral surface, concave below, keeled above; acuminate; margins entire, recurved in the lower ½ to 2/3; costa percurrent, surface ventral cells elongate, guide cells well-developed, ventral stereid cells weakly present, dorsal stereid cells present, ventral surface cell layer somewhat enlarged; upper and basal cells weakly differentiated, upper cells irregularly rounded or angled, quadrate, or oblate, 6–10 µm wide, thick-walled, with 1(2) low, blunt, inconspicuous papillae, basal cells oblate, quadrate to short-rectangular, thick-walled, smooth or inconspicuously papillose, to 6–18 µm long,

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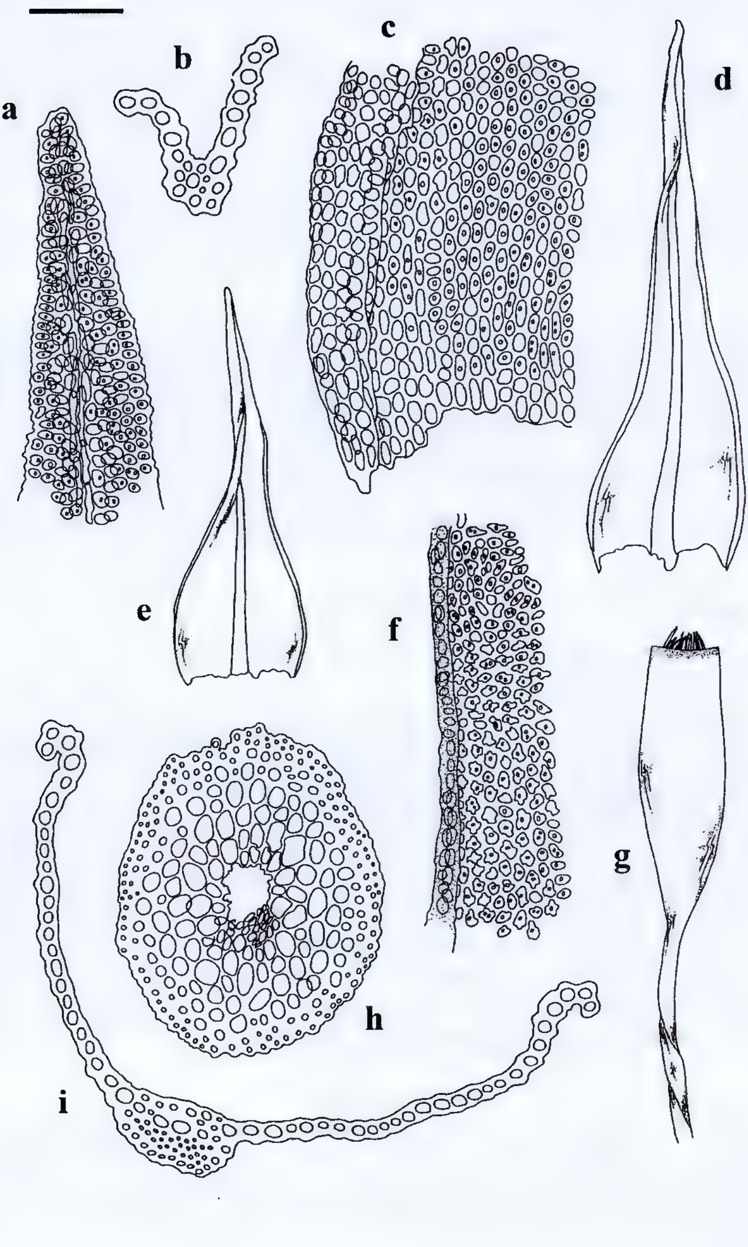
Figure 3. *Didymodon fallax*. a. Leaf apex. b. Cross-section in upper part of leaf. c. Basal leaf cells. d. & e. Leaves. f. Leaf margin and cells at midleaf. g. Capsule. h. Cross-section in lower part of leaf. i. Stem cross-section. Scale bar in mm: bar = 0.05 (b,i); bar = 0.06 (a,c,f,h); bar = 0.2 (d,e); bar = 0.5 (g);. Figures a, c–g from *Ledlie 554* (MO), all other figures from *Spaulding 117* (MO).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alar cells not differentiated. Dioicous. Perichaetia and perigonia terminal. Setae smooth, 7–10 mm long, red. Capsules cylindric, erect, 1.0–2.0 mm long, smooth; stomata present in neck; opercula erect, long-conic, 1 mm long; exothecial cells short-rectangular, firm-walled; annuli not vesiculose; peristome red, basal membrane absent, teeth spiculose, weakly twisted. Spores 10–12 µm, smooth. Calyptrae not seen. n = 13 (Fritsch 1991).

On soil and old lime tailings. In Maine known from Knox (*Ledlie 554* MO; *Spaulding 117* MO) County. The species has been reported from Waldo County (Parlin 1924, 1939).

Didymodon fallax has ovate-lanceolate leaves with strongly recurved margins, and a costa that has two stereid bands as well as elongate cells on the upper ventral surface. Its leaves are strongly keeled above, and this often makes the cells on the upper ventral surface of the costa difficult to observe. The upper and lower leaf cells in *D. fallax* are weakly differentiated and most of the cells are oblate to rounded with irregularly thickened to angular walls. Sterile collections can be recognized as belonging to the Pottiaceae on the basis of their strongly rounded and thickened leaf cells with inconspicuous papillae at least on the upper leaf cells.

Excluded species

Didymodon luridus Hornsch. *ex* Spreng.

This species has been reported from Hancock (Mt. Desert, Greenwood 1927) and Oxford Counties (Howard Hill, Hartford, Parlin 1939), but I have not been able to locate these collections. *Didymodon luridus* is not otherwise known from eastern North America and it seems unlikely these Maine reports of the species are correctly named. *Didymodon luridus* is a small species with short-lanceolate, ovate-lanceolate, or triangular-lanceolate leaves that have obtuse or broadly acute apices, smooth to weakly papillose leaf cells, a broad, subpercurrent costa, and quadrate cells on the upper ventral surface of the costa. *Barbula convoluta* is similar to *D. luridus* in its obtuse or broadly rounded leaf apices and subpercurrent costae, it differs in having elongate cells on the upper ventral surface of the costa and densely pluripapillose leaf cells.

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Cetraria sepincola new to Idaho and *Melanelia septentrionalis* new to Montana, with notes on their distribution and ecology

Toby Spribille[1] and Annette Kolb[2]

Cetraria sepincola (Ehrh.) Ach. and *Melanelia septentrionalis* (Lynge) Essl. are widespread circumboreal lichen species found across Canada and northern Eurasia, primarily in boreal climates. They are among a handful of lichen species with their primary distribution on the twigs and branches of bog birches (*Betula* sect. Humiles W.D. Koch). The degree of preference for a specific section of a phorophyte genus shown by these two species is unusual for macrolichens in temperate forested ecosystems, where the majority of epiphytic species have broad autecological amplitudes. Also conspicuous about these two species is their shiny dark brown colour, their lack of isidia or soredia, and their propensity for producing abundant apothecia, often in knobby mounds, which at times makes them superficially similar to each other in appearance.

Cetraria sepincola is found in northern Europe primarily on *Betula pubescens* and hybrids between *B. pubescens* and *B. pendula* (Wirth & Türk 1973), chiefly in and around peatlands, but also in subalpine dwarf pine communities, as far south as the Alps, Slovenia and the Ukraine (Kondratyuk et al. 1996). More rarely it has been reported from rocks, and even from the stems of grasses in sand dunes (Motiejūnaitė et al. 1998). The species has a more or less continuous distribution across southern Greenland, Alaska and Canada (Thomson 1984), where it has been reported from *Betula glandulosa*, *B. papyrifera*, *Shepherdia canadensis* and even *Pinus contorta* ssp. *latifolia* in bog habitats (Goward & Ahti 1992). In the United States, the species has been reported from New York, Michigan and Wisconsin (Thomson 1984), Washington (Goward & McCune 1994), Alaska and northern California (Thomson 1984; McCune & Geiser 1997) and from a single collection from the Swan Valley, Montana (McCune 1982), where it was found growing on the bark of an unspecified *Betula* species.

In the past five years, the known range of *Cetraria sepincola* in the northern Rocky Mountains has increased considerably (Fig. 1). At all of the recently discovered localities, the species is always on twigs of bog birches (*Betula glandulosa* or forms transitional to *B. pumila*, both members of sect. Humiles) in open peatlands or in carrs. Older or dead twigs seem to be preferred over live twigs, except in exceptional sites where *C. sepincola* is abundant. *C. sepincola* is

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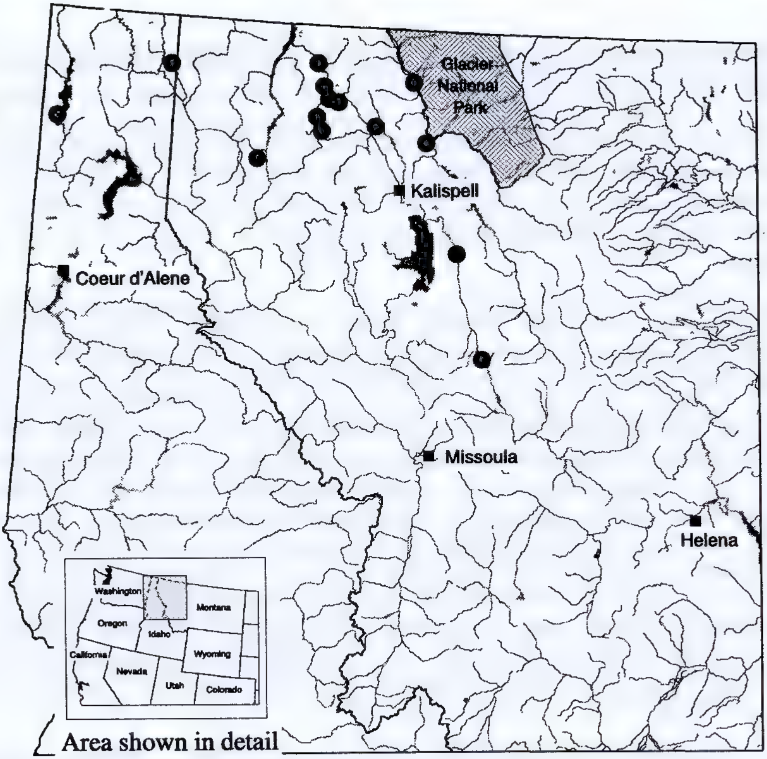

Figure 1. Presently known distribution of *Cetraria sepincola* (Ehrh.) Ach. in northern Idaho and western Montana.

found most often in bog birch carrs belonging to mostly undescribed communities of the order *Betuletalia pumilae-glanduliferae* Kojima 1986 (Kojima 1986), in colline to montane localities at elevations between 800 and 1200 m s.m.. However, it seems to be absent in some valley-bottom bog birch carrs even where available twig habitat is abundant. It is most abundant in bog birch sites with continuous fresh water supply (such as soligeneous fens), and is rare in limnogeneous wetlands. *C. sepincola* forms distinct communities with several other lichen species which favour bog birch twigs: associated species typically include *Parmeliopsis ambigua*, *P. hyperopta*,

Vulpicida pinastri, *Lecanora circumborealis*, *Lecanora varia* and *Rinodina septen-trionalis*. A community with *Cetraria sepincola* and *Parmeliopsis* species has been described by cryptogam sociologists in central Europe as *Cetrarietum* *sepincolae* Ochsner *ex* Klement 1955 (Wirth & Türk 1973), a name which might be used for our communities as well.

All of the known recent collections are cited here. The species is new to Idaho from two locations and to Glacier National Park, Montana, where it was not reported by DeBolt & McCune (1993). All of the specimens reported here were collected by the first author and are deposited at COLO, unless otherwise indicated.

Specimens examined: U.S.A. **IDAHO: Bonner Co**., Kaniksu Marsh, *Mousseaux & Spribille 7035* (COLO, UBC, herb. Spribille); **Boundary Co**., northeast of Moyie Springs, Perkins Lake, *9726*; **MONTANA: Flathead Co**., northern Salish Mountains, Magnesia Creek, fen along creek, *3936a* (COLO, herb. Spribille), *4082* (COLO, herb. Spribille); confluence of Lime and Magnesia Creeks, *4376* (COLO, herb. Esslinger); Whitefish Range, North Fork Flathead Road, ca 9 km north of Columbia Falls, *7916*; five km east of Olney, Lazy Creek Meadow, *9704*; Glacier National Park, Winona Lake, *Damm & Spribille 9120* (GNP); **Lincoln Co**., northern Salish Mountains, White Creek, *5051*; Fortine Creek watershed, Twin Meadows Creek, fen at head of drainage, *7891*; Sunday Creek watershed, Blessed Creek, fen along creek, *7752*; Fortine Creek watershed, Basin Creek, *7927*; along Fortine Creek, Round Fen, *7356*; south of Eureka, Dalberg Siding, 1.4 miles north of Barnaby Lake, along railroad, *4537*; Edna Creek watershed, Ivor Creek, *7440*; Dudley Slough area, *5873*, *9701*; south of Libby Dam, Doe Creek, marsh north of Lost Lake, *7116* (COLO, ORST); **Missoula Co**., Swan Valley, Summit Lake, *Kolb 179* (herb. Kolb).

Melanelia septentrionalis has turned up in similar habitats as *Cetraria sepincola*, but at consistently lower elevations and in warmer valley-bottoms. It appears to entirely replace *C. sepincola* in many of these habitats. It is also much rarer, being known in the area of interest only from a few localities to date in the Rocky Mountain Trench of northwestern Montana and southeastern British Columbia (between Invermere and the Montana border). Prior to this, the species had not been reported from Montana, or from British Columbia south of Wells-Gray Provincial Park (Goward & McCune 1994). It is frequent in the Great Lakes region and has been mapped for North Dakota (Esslinger 1977). To the south the species has been reported from only from a single station in Colorado (Weber & Wittmann 1992).

Specimens examined: CANADA. **BRITISH COLUMBIA**: along Hwy. 3 just west of Jaffray, *9614*; Hwy. 3 ca. 2 km south of road to Whiteswan Provincial Park, between Canal Flats and Invermere, locally common, *9624* (herb. Kolb, COLO, UBC); U.S.A. **MONTANA**: **Flathead Co.,** confluence of Lime and Magnesia Creeks, growing with *Cetraria sepincola*, *4375* (herb. Esslinger, herb. Spribille); Magnesia Creek, *3936-B* (COLO); **Lincoln Co.,** between Trego and Fortine, Ant Flat, along nature trail, *4102* (herb. Esslinger).

Acknowledgments. Thanks are extended to M. Hauck, C. Wolfram and A. Solomeshch for help with literature, to T. Esslinger for verifying the Montana specimen of *Melanelia septentrionalis*, and to J. Sheard for verifying the *Rinodina septentrionalis*.

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Thirteen Additions to the Checklist of Maine Mosses.

Bruce Allen

A recent checklist of the mosses found in Maine (Allen 1999) listed 402 taxa from the state. Since the publication of that Checklist thirteen mosses not included in the list have been found in the state. This raises the number of Maine mosses to 415. Since there are several groups of mosses still under collected in the state I expect the number of mosses found in Maine will eventually reach about 440. The records listed below are the result of two types of activities: recent field work, my own and that of the energetic and enthusiastic local Maine moss group (Alison Dibble, Neva Hax, Pat Ledlie, Marilyn Mollicone, Betsy Newcomer, Sally Rooney, Lisa St. Hilaire, and Dorothy Spaulding), and the examination of historical collections in the herbaria at MAINE (Sally Rooney), BH (Bruce Allen), and FH (New England Botanical Club collection, Pat Ledlie, Bruce Allen).

Seligeriaceae

Seligeria recurvata (Hedw.) B.S.G. Somerset: Moxie Falls, *Collins 3085* (FH).

Dicranaceae

Cynodontium schistii (Web. & Mohr) Lindb. Oxford: Grafton Township, Screw Auger Falls, 44°37'N; 70°54'W, *Allen 22212* (MO).

Grimmiaceae

Racomitrium aduncoides Bednarek-Ochyra. Oxford: Buckfield Township, Streaked Mountain, 44°14'46"N; 70°25'30"W, *Allen 22191* (MO).

Racomitrium affine (Schleich. *ex* Web. & Mohr) Lindb. Lincoln: Boothbay Harbor Township, Spruce Point, 1.5 miles SE of Boothbay Harbor, 43°50'N; 69°37'W, Allen & Pursell, *Maine Mosses Exsic. 34* (DUKE, MAINE, MO, NY, US).

Bryaceae

Pohlia andalusica (Höhn.) Broth. Piscataquis: T9 R15 WELS Township, Crescent Lake, 46°26'14"N; 69°36'22"W, *Allen 21615* (MO).

Mniaceae

Cinclidium stygium Sw. *in* Schrad. Aroostook: Crystal Township, Crystal Bog, *Ledlie 641, Spaulding 111* (MO); Weber Fen, *Ledlie 675* (MO).

Meesiaceae

Paludella squarrosa (Hedw.) Brid. Aroostook: Perham Township. Grill's Swamp (Mud Pond Fen). Perham, *Rachel Lowe* (MAINE, MO).

Hedwigiaceae

Hedwigia stellata Hedenäs. Oxford: Hebron, on side of road near house, July 14 1897, *M.L. Stevens 416* (FH).

Missouri Botanical Garden, P.O. Box 299, St. Louis MO 63166-0299

Neckeraceae

Neckera complanata (Hedw.) Hüb. Hancock: Sutton's Island, off Mount Desert Island, *Theodore G. White 94-29* (BH, MO).

Leskeaceae

Pseudoleskeella tectorum (Funck *ex* Brid.) Kindb. *ex* Broth. Somerset: T8 R16 WELS Township, 4.5 miles NW of west end of Lake St. Francis, 46°22'31"N; 69°49'42"W, *Allen 21529* (MO).

Amblystegiaceae

Hygroamblystegium tenax (Hedw.) Jenn. var. *spinifolium* (Schimp.) Jenn. Knox: Rockport, west bank Goose River, *Ledlie 572* (MO).

Brachytheciaceae

Eurhynchium praelongum (Hedw.) Schimp. *in* B.S.G. Franklin: Wyman Township, Bigelow Mountain, along Fire Warden Trail, 5.5 miles SE of Stratton, 45°08'13"N; 70°25'48"W, *Allen 22626* (MO).

Buxbaumiaceae

Buxbaumia minakatae Okam. York: York Township, base of Mount Agamenticus, 43°13'01"N; 70°41'42"W, *Magombo 6014* (MO).

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Allen, B. 1999. Checklist of Maine Mosses. Evansia 16: 28–43.

Hepatophyta and Anthocerotophyta of Alabama I. Preliminary Studies.

Stephen L. Timme[1] and Frank D. Bowers[2]

The liverwort and hornwort flora of Alabama is poorly known and published reports are few and scattered. The first collections indicated by herbarium studies are from the late 1800's. The first attempt to enumerate the liverwort and hornwort flora for the state was by Mohr (1901) as part of an effort by the State Geological Survey to report all plants, both vascular and nonvascular, for Alabama. In this survey, Mohr (1901) reported 43 species of liverworts and four species of hornworts. Several of these have undergone synomy or nomenclatural changes since Mohr's publication. Briel (1970) studied the liverworts and hornworts of the Mid-Gulf Coastal Plain that included Barbour, Henry, Dale, Geneva, and Houston counties in southeastern Alabama. The results of this study included two species of hornworts and 48 species of liverworts. Schuster's (1969-1980, 1992) *magnus opus* on the hepatic and hornwort flora found east of the hundredth meridian in North America reports 63 taxa for the state. No extensive study of the two groups for the state has been attempted. This study provides a preliminary checklist of the hepatic and hornwort flora for Alabama. The checklist is the result of field work by the authors, literature review, and herbarium studies. An asterisk indicates a new record for the state.

Alabama is an ecologically diverse state lying between $30^0 31'$ N and $35^0 00'$ N latitude. The northern half of the state is a complexity of mountains resulting in a wide range of geologic features. These mountains reach a maximum height of 824 meters above sea level. The southern half of the state is characterized by a variety of habitats, including savanna, prairie, swamp, pine woodlands, and hardwood forests. The topography is rolling hills and shallow to deep ravines grading into coast land in the south. Maximum height of topography near the coast is 91 meters. Three miles off the coast is an approximately 22 kilometer barrier island that is vegetated on the eastern side and vegetation bare on the western side. The state is drained by a diverse system of rivers and smaller streams. The most significant are the Tennessee and Coosa in the north and the Alabama, Tombigbee, and Chattahoochee in the southern half. The climate in Alabama is subtropical at the southern limit and mild temperate in the north.

The following is an initial alphabetical list of species within family, based in part on Schuster (1969-1980, 1992) and Stotler and Crandall-Stotler (1977). Families are arranged phylogenetically within the Hepatophyta. Each entry includes a list of counties where it has been collected. Collector(s) and collection numbers or

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literature reference follow the counties. A collector's name and number following each county represents a collected specimen and names in parentheses represents a literature report. Specimens are deposited in KSP, UNA, UNAF, FLAS, FSU,

The below list represents an initial effort to catalog the state's liverwort and hornwort flora. A total of 91 taxa representing 25 families are reported here. The Lejeuneaceae contains the largest number of taxa, 19 species (21% of the reported flora) and the genus *Frullania* contains the largest number of species, 9 (10% of the reported flora). The "leafy" liverworts constitutes the greatest number of taxa with 66. Continued field work of Alabama's diverse habitats will undoubtedly result in new species for the state and new county records of many of those listed here.

ANTHOCEROTOPHYTA (Hornworts)

ANTHOCEROTACEAE

Anthoceros laevis ssp. *carolinanaus* (L.) Schust. - Coffee, Colbert, Dale, Franklin, Geneva, Houston, Lawrence, Mobile, Monroe, Pike, Tuscaloosa, Wilcox. *Timme 9319.*

Aspiromitus adscendens (L. & L.) Schust. - Mobile (in Mohr as *A. ravenellii* Aust.).

A. punctatus ssp. *agrestis* var. *agrestis* (Paton) Schust. - Calhoun, Mobile (in Mohr 1901 as *Anthoceros punctatus* L.).

Notothylas orbicularis (Schwein.) Sull. - Coffee, Colbert. *Timme & Bowers 9305.*

HEPATOPHYTA (Liverworts)

PSEUDOLEPICOLEACEAE

Blepharostoma trichophyllum (L.) Dum. - Walker. *Timme 9033.*

TRICHOCOLEACEAE

Trichocolea tomentella (Ehrh.) Dum. - Cherokee, Colbert, Dale, Etowah, Franklin, Lauderdale, Lawrence, Wilcox, Winston, *Timme 10737.* Probably more widespread in the state than indicated here.

LEPIDOZIACEAE

Bazzania trilobata (L.) S. Gray - Colbert, Cleburne, Conecuh, Dekalb, Franklin, Jackson, Lawrence, Marion, Mobile, Tuscaloosa, Walker, Winston. *Timme 9128.* Probably more widespread in the state than indicated here.

Microlepidozia sylvatica (Evans) Joerg. - Colbert, Dekalb, Franklin, Jackson, Lawrence, Marion, Mobile, Monroe.(Sullivant 1846).

Telaranea nematodes (Gott.) Howe - Houston, Jackson, Monroe, Winston. *Timme 9090.*

CALYPOGEJACEAE

Calypogeja fissa subsp. *neogaea* Schust. - Cherokee, Chilton, Colbert, Conecuh, Crenshaw, Dale, Dekalb, Etowah, Franklin, Houston, Jackson, Lauderdale, Lawrence, Marion, Mobile, Walker, Winston. *Timme 6471.*

C. muelleriana (Schiffn.) K. Müll. subsp. *muelleriana* - Cullman, Franklin, Lawrence, Limestone. *Timme 8969.*

C. peruviana Nees & Mont. - Franklin, Lawrence. *Timme & Bowers 8909.*

C. sullivantii Aust. - Cherokee, Colbert, Cullman, Etowah, Fayette, Franklin, Jackson, Jefferson, Lauderdale, Lawrence, Marion, Mobile, Winston. *Davison 2102*

CEPHALOZIACEAE

Cephalozia bicuspidata (L.) Dum. - Franklin, Jackson, Lawrence, Marion, Winston. *Timme 9091.*

C. catenulata (Huben.) Lindb. - Bibb, Coffee, Colbert, Conecuh, Dekalb, Franklin, Lawrence, Lee, Mobile, Tuscaloosa, Wilcox. *Timme 9360.*

C. connivens (Dicks.) Lindb. - Franklin, Jackon, Lauderdale, Lee, Marion, Monroe, Winston. *Timme 8912.*

C. lunulifolia (Dum.) Dum. - Coffee, Franklin, Jackson, Lawrence, Lee, Marion, Mobile, Monroe, Tuscaloosa, Walker, Winston. *Timme 9321.*

Nowellia curvifolia (Dicks.) Mitt. - Cherokee, Etowah, Franklin, Jackon, Lawrence, Limestone, Tuscaloosa. *Timme 9142.*

ADELANTHACEAE

Odontoschima denudatum (Nees ex Mart.) Dum. var. *denudatum* - Cherokee, Etowah, Jackson, Lawrence, Lee, Marion, Mobile. *Davison 3195.*

O. prostratum (Sw.) Trev. - Barbour, Coffee, Colbert, Conecuh, Cullman, Dekalb, Franklin, Jackson, Lauderdale, Lawrence, Lee, Marion, Mobile, Monroe, St. Clair, Walker, Winston, Wilcox. *Timme 9549.* Probably more widespread in the state than indicated here.

LOPHOCOLEACEAE (nomenclature for *Chiloscyphus* see Engel & Schuster 1984)

Chiloscyphus apalachicolus (Schust.) Engel & Schust. - Dale (Schuster 1980).

C. pallescens (Ehrh. ex Hoffm.) Dum. - Cherokee, Conecuh, Dale Etowah, Lauderdale, Wilcox. (Breil 1970).

C. profundus (Nees) Engel & Schust. - Colbert, Etowah, Fayette, Franklin, Jackson, Lauderdale, Limestone, Marion, Monroe, Walker

CEPHALOZIELLACEAE

Cephaloziella hampeana (Nees) Schiffn. ex Loeske - Walker. *Timme 9032.*

C. hyalina Douin - Chilton, Coffee, Conecuh, Dekalb, Lauderdale, Marion, Tallapoosa, Tuscaloosa, Walker, Winston. *Timme & Bowers 9325.*

C. rubella (Nees) Warnst. var. *rubella* - Marion (Schuster 1980).

PLAGIOCHILACEAE

Plagiochila asplenoides subsp. *porelloides* (Torr. ex Nees) Schust. - Colbert, Cullman, Dekalb, Franklin, Jackson, Lauderdale, Lawrence, Marion, Mobile, Winston. *Timme 10722.* Probably more widespread in the state than indicated here.

P. dubia Lindenb. & Gott. - Dale. (Breil 1970).

P. ludoviciana Sull. - Geneva, Lawrence, Houston, Mobile. *Davison 1942.*

JUNGERMANNIACEAE

Jungermannia lanceolata L. - Morgan (Schuster 1969).

Solenostoma gracillimum (Smith) Schust. - Lee (Schuster 1969).

S. hyalinum (Lyell in Hook.) Mitt. - Lee (Evans 1919).

SCAPANIACEAE

Diplophyllum apiculatum (Evans) Steph. var. *apiculatum* - Cherokee, Cullman, Dekalb, Franklin, Jackson, Lawrence, Marion, Winston. *Timme 10738.*

Scapania nemorosa (L.) Dum. - Barbour, Bill, Cherokee, Chilton, Coffee, Colbert, Conecuh, Coosa, Crenshaw, Cullman, Dale, Dekalb, Elmore, Etowah, Fayette, Franklin, Houston, Jackson, Lauderdale, Lawrence, Lee, Mobile, Marion, Monroe, Randolph, St. Clair, Tallapoosa, Walker, Winston. *Timme 10724.* Probably in every county.

RADULACEAE

Radula australis Aust. - Baldwin, Conecuh, Dekalb, Marion, Tuscaloosa. *Timme 8721.*

R. floridana Castle - Mobile (Schuster 1980). In Briel 1970 as *R. sullivantii* for Dale and Houston Counties.

R. mollis Lindenb. & Gott. - Cherokee, Cleburne, Conecuh, Dekalb, Geneva, Houston, Jackson, Lawrence. *Davison 2064.*

R. obconica Sull. - Cherokee, Colbert, Coosa, Dale, Etowah, Franklin, Houston, Jackson, Lauderdale, Lawrence, Marion, St. Clair, Winston. *Timme 10740.*

R. tenax Lindb. - Cullman, Franklin. *Timme & Bowers 9143.*

PORELLACEAE

Porella pinnata L. Baldwin, Bibb, Calhoun, Cherokee, Colbert, Conecuh, Dale, Dekalb, Etowah, Greene, Houston, Jackson, Jefferson, Lauderdale, Lawrence, Limestone, Marshall, Mobile, Monroe, Pickens, St. Clair, Tuscaloosa, Walker. *Timme 9024.* Probably in every county.

P. platyphylla (L.) Pfeiff. Calhoun, Cherokee, Clebourne, Colbert, Conecuh, Elmore, Etowah, Jackson, Jefferson, Lauderdale, Lawrence, Limestone. *Timme & Bowers 6747.* We have included the once recognized *P. platyphylloidea* (Schwein.) Lindb. under *P. platyphylla* from evidence presented by Therrien, Crandall-Stotler and Stotler (1998).

JUBULACEAE

Frullania brittoniae Evans - Houston, Lawrence, Marion, Tuscaloosa. *Timme 8641.*

F. donnellii Aust. - Marion, Mobile. *Timme 8713.*

F. eboracensis Gott. - Chilton, Colbert, Conecuh, Franklin, Lawrence, Houston, Tuscaloosa, Walker. *Timme 8960.*

F. ericoides (Nees) Mont. - Barbour, Chilton, Clay, Coffee, Colbert, Conecuh, Cossa, Cullman, Dale, Etowah, Fayette, Franklin, Houston, Jackson, Jefferson, Lauderdale, Lawrence, Limestone, Marion, Mobile, Tallapoosa, Walker, Winston. *Timme 9356.* Probably in every county.

F. inflata Gott. Bibb, Celeburne, Colbert, Conecuh, Dekalb, Etowah, Fayette, Franklin, Houston, Jackson, Lauderdale, Lawrence, Limestone, Montgomery, Tuscaloosa, Walker. *Timme 9356.* Probably in every county.

F. kunzei Lehm. & Lindenb. - Coffee, Colbert, Conecuh, Etowah, Franklin, Geneva, Jackson, Lawrence, Marion, Mobile, Monroe, St. Clair, Winston. *Timme 9365.*

F. obcordata Lehm. & Lindenb. - Coffee, Conecuh, Dale, Franklin, Houston. Lawrence, Marion, Mobile, Monroe. *Timme 9263.*

F. riparia Hampe - Mobile (in Mohr 1901 as *F. aeolotis* Nees).

F. tamarisci subsp. *asagrayana* (Mont.) Hatt. - Bibb, Colbert, Dekalb, Etowah, Franklin, Jackson, Lawrence, Marion, St. Clair, Tuscaloosa, Winston. *Timme 8900.*

Jubula pennsylvanica (Steph.) Evans - Cherokee, Colbert, Cullman, Dale, Dekalb, Elmore, Franklin, Jackson, Lauderdale, Lawrence, Marion, Tuscaloosa, St. Clair, Winston. *Timme 9087.*

LEJEUNEACEAE

Cheilolejeunea clausa (Nees et Mont.) Schust. - Bibb, Mobile, Tuscaloosa. *Bowers 12010.*

C. myriantha (Nees & Mont.) Schust. - Baldwin, Mobile (Schuster 1980).

C. rigidula (Mont.) Schust. - Butler, Conecuh, Coosa, Dale, Escambia, Geneva, Houston, Mobile. *Timme 9345.*

Cololejeunea biddlecomiae (Aust.) Evans - Cherokee, Colbert, Etowah, Jackson, Jefferson, Lauderdale, Lawrence, Limestone, Mobile, Walker, Winston. *Timme 9044.*

C. cardiocarpa (Mont.) Schust. - Geneva, Lauderdale, Lawrence, Monroe, Mobile, Tuscaloosa. *Timme 6582.*

C. minutissima (Smith) Schiffn. subsp. *minutissima* - Baldwin. (Schuster 1980).

C. setiloba Evans - Geneva. (Breil 1970).

Lejeunea calcicola Schuster. var. *calcicola* - Conecuh, Dale. (Breil 1970).

L. cladogyna Evans - Bibb, Butler, Coffee, Conecuh, Coosa, Dale, Houston, Walker, *Timme 9274.*

L. flava (Sw.) Nees - Bibb, Butler, Coffee, Cullman, Dale, Franklin, Geneva, Houston, Jefferson, Mobile, Pike, Russell, Walker. *Timme & Bowers 9296.*

L. floridana Evans - Dale. (Breil 1970).

L. laetivirens Nees et Mont. - Colbert, Cullman, Dale, Dekalb, Escambia, Etowah, Geneva, Jackson, Lawrence, Mobile, Walker, Winston. *Timme 10742.*

L. ulicina subsp. *bullata* (Tayl.) Schust. - Mobile. (Schuster 1980).

Leucolejeunea clypeata (Schwein.) Evans - Butler, Cherokee, Chilton, Coffee, Colbert, Coosa, Cullman, Dale, Dekalb, Etowah, Fayette, Franklin, Geneva, Jackson, Jefferson, Lauderdale, Lawrence, Limstone, Marshall, Marion, Mobile, Monroe, St. Clair, Tallapoosa, Walker, Winston. *Timme 10746.* Probably in every county.

L. conchifolia Evans - Conecuh, Cullman, Franklin, Jackson, Lawrence, Marion, St. Clair. *Timme 8647.*

L. unciloba (Lindenb.) Evans - Barbour, Bibb, Butler, Cleburne, Colbert, Conecuh, Etowah, Franklin, Houston, Jackson, Lawrence, Limestone, Monroe, St. Clair. *Timme 9123.*

L. xanthocarpa (Lehm. et Lindenb.) Evans - Mobile.

Mastigolejeunea auriculata (Wils. et Hook.) Schiffn. - Mobile, Wilcox. (in Mohr 1901 as *Lejeunea auriculata* Hook. & Wils.).

Rectolejeunea maxonii Evans - Barbour, Cherokee, Chilton, Colbert, Conecuh, Etowah, Jackson, Jefferson, Lawrence, Marion, Mobile, Walker, Winston. *Timme 9053.*

CODONIACEAE

Pallavicinia lyelii (Hook.) Gray - Baldwin, Bibb, Cherokee, Coffee, Colbert, Conecuh, Coosa, Cullman, Dekalb, Escambia, Fayette, Franklin, Geneva, Jackson, Lawrence, Lee, Marion, Mobile, Monroe, Montgomery, Pike, Tuscaloosa, Walker, Winston. *Timme 7004.* Probably in every county.

PELLIACEAE

Pellia epiphylla (L.) Lindb. - Calhoun, Cherokee, Coffee, colbert, Dale, Dekalb, Fayette, Franklin, Jackson, Lauderdale, Lawrence, Lee, Limestone, Marion, Tuscaloosa, Walker, Winston. *Timme & Bowers 9000.* Probably more widespread in the state than indicated here.

METZGERIACEAE

Metzgeria furcata (L.) Dum. - Cherokee, Cleburne, Colbert, Conecuh, Cullman, Franklin, Houston, Marion, Pike, Tallapposa, Walker, Winston. *Timme & Bowers 10742.*

M. myriopoda Lindb. - Cherokee, Dale, Geneva, Houston, Pike, Walker. *Timme & Bowers 10742.*

M. uncigera Evans - Mobile. (Schuster 1992).

ANEURACEAE

Aneura pinguis (L.) Dum. - Colbert, Conecuh, Sumter, Winston. *Nonnenmacher 91-61.* Probably more widespread in the state than indicated from known collections.

Riccardia latifrons Lindb. - Colbert, Dale, Franklin, Lee, Marion, Mobile. *Timme 8677.*

R. multifida (L.) S. Gray - Coffee, Conecuh, Dale, Lawrence, Monroe, Winston. *Timme & Bowers 9303.*

R. palmata (Hedw.) Carruth. - Mobile. (Schuster 1992).

SPHAEROCARPACEAE

Sphaerocarpos texanus Aust. - Baldwin, Lauderdale. *Timme 6763.*

AYTONIACEAE

Asterella tenella (L.) Beauv. - Colbert, Conecuh, Dekalb, Jackson, Lawrence, Lee,Marion, Mobile, Randolph, Tuscaloosa. *Timme 4286.* Probably more widespread in the state than indicated from known collections.

Reboulia hemisphaerica (L.) Raddi - Conecuh, Cullman, Dekalb, Etowah, Franklin Jackson, Lauderdale, Lawrence, Lee, Marion, Mobile, Tuscaloosa, Winston. *Timme 8887.* Probably in every county.

CONOCEPHALACEAE

Conocephalum conicum (L.) Lindb. - Bibb, Coffee, Colbert, Conecuh, Cullman, Dale, Dekalb, Etowah, Jackson, Lauderdale, Lawrence, Marion, Monroe, Tuscaloosa, Winston. *Timme & Bowers 8891.* Probably in every county.

MARCHANTIACEAE

Dumortiera hirsuta (Sw.) Nees - Colbert, Coffee, Conecuh, Cullman, Dale, Jackson, Lauderdale, Lawrence, Lee, Limestone, Marion, Monroe, Winston. *Timme & Bowers 9110.* Probably more widespread in the state than indicated here.

Marchantia papillata subsp. *inflexa* (Nees et Mont) Schust. - Colbert, Coffee, Dale, Dallas, Jackson, Jefferson, Lee, Monroe

M. paleacea Bertol. - Dale, Monroe. *Timme 6584.*

RICCIACEAE

Riccia fluitans L. - Lauderdale, Lee, Mobile. *Timme 6746a.*

R. lamellosa Raddi - Mobile. (in Underwood 1984, no loc.).

R. sorocarpa Bisch. - (in howe 1923, no loc.).

R. huebenerian subsp. *sullivantii* (Aust.) Schust. - Montgomery. *Timme 9198.*

Ricciocarpos natans (L.) Corda. (in Mohr 1901 as *Riccia lutescens* Schw.).

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Trichostomum and *Weissia* (Musci: Pottiaceae) in Maine

Bruce Allen

Trichostomum is a widespread genus of 116 small to moderate-sized species (Crosby *et al.* 2000). In a general way the genus has stems with a hyaloderm and central strand; narrow leaves that are erect to appressed at base and incurved contorted above when dry; distinctly different upper and basal leaf cells with the basal leaf cells usually thin-walled; costa that is stoutly excurrent into a smooth mucro, has guide cells, two well-developed stereid bands, and enlarged, papillose ventral surface cells. The leaf margins in *Trichostomum* can be plane, erect, or distinctly incurved above, and although most species lack a border of hyaline cells that run up the basal margins, the feature is at times weakly present. Most species of *Trichostomum* have 16, short, erect peristome teeth on a low basal membrane. There is only one species of *Trichostomum* in Maine and so the genus here lacks much of the variation which makes it so taxonomically difficult in a world-wide context. Key features for the recognition of the genus in Maine are its lanceolate leaves with two costal stereid bands, lax, thin-walled basal leaf cells that run up the plane to erect margins somewhat in a v-shaped pattern, and pluripapillose upper leaf cells.

There are three genera in Maine that may be confused with *Trichostomum*: *Weissia*, *Bryoerythrophyllum*, and *Tortella*. All four have similarly shaped leaves, costae with two stereid bands, and lax, thin-walled basal leaf cells. The peristomes of *Weissia* and *Trichostomum* are also similar, however in Maine *Weissia* differs in its often yellow-green color, strongly involute upper leaf margins and smaller plant size. In an broader context these features hardly serve to distinguish the two genera since *Trichostomum* has some *Weissia*-sized species as well as species with involute leaf margins. The only species of *Bryoerythrophyllum* in Maine differs from *Trichostomum* in having leaves reddish at base, dentate at the apex, large c-shaped papillae, strongly revolute margins, and a synoicous or paroicous sexual condition.

Tortella is perhaps an easier genus in Maine to confuse with *Trichostomum*. In differs from *Trichostomum* in having long, spirally twisted peristome teeth, a high basal membrane (outside the region there are some gymnostomous as well as cleistocarpous species of *Tortella*) and a well-developed basal leaf border of hyaline cells that run up the margins in a distinct v-shaped pattern. Unfortunately, the last of these features is weakly expressed in the Maine species of *Trichostomum* and since that species is dioicous most collections lack sporophytes. In evaluating the basal leaf border feature of these two genera in Maine it is important to keep in mind that the condition in *Tortella* is so strong

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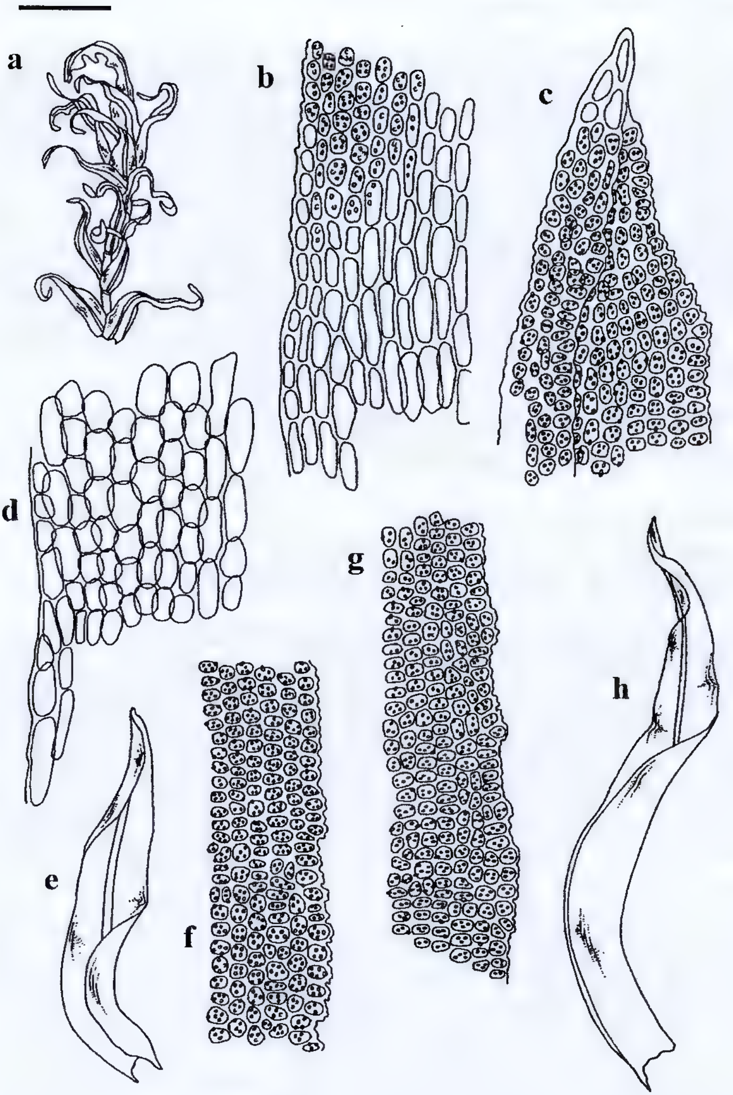
and distinctive there is no question of its presence. In *Trichostomum* as a rule the feature is so weakly expressed there is usually considerable uncertainly as to whether or not the feature is present.

The Maine species of *Trichostomum* is sometimes segregated into the genus *Oxystegus* (See Stoneburner 1985, p. 294, Norris & Koponen 1989, Hedenäs 1989, Zander 1994a) on the basis of such features as the absence of a peristomal basal membrane, fragile leaves, plain upper leaf laminae, broadly sheathing leaf bases with the basal leaf cells running up the margins in a v-shaped pattern, and distinct cellular areolation at the leaf shoulders. It is difficult to maintain these two genera when they are considered on a world rather than regional level because such a treatment results in the unnatural separation of clearly related species (Crum & Anderson 1981). According to Zander (1993) "... *Oxystegus* cannot be maintained at the world level because of considerable variation in expression and combination of characters among the species."

The name *Trichostomum* combines the Greek *tricho-* (hair) and *stoma-* (mouth) in reference to its filiform peristome teeth.

Trichostomum Bruch., Flora 12: 396. 1829.
Oxystegus (Limpr.) Hilp., Beih. Bot. Centralbl. 50(2): 666. 1933.
Trichostomum subg. *Oxystegus* Limpr., Labm. Deutschl. 1: 569. 1888.

Plants small to medium-sized, yellow-green to green above, brown to reddish below, in dense or loose tufts. Stems red, erect, hyaloderm present or absent, central strand present; sparsely and irregularly branched; rhizoids moderately developed below. Leaves ligulate, oblong-lanceolate, lanceolate, or linear-lanceolate, erect at base, incurved, twisted and contorted above, concave to tubulose above when dry, erect-spreading, spreading, or squarrose when wet; acute to acuminate; lamina unistratose, often fragile and broken above; margins entire, at times serrulate to denticulate at the shoulders, plane, erect, or incurved above; costa mostly stoutly excurrent as a smooth mucro, sometimes percurrent or subpercurrent, guide cells and two stereid bands well-developed, ventral surface layer enlarged, papillose; upper cells sub-quadrate, oblate, to short rectangular, firm-walled, pluripapillose, basal cells hyaline, smooth, enlarged, rectangular, thin-walled, bulging, or long-rectangular to linear, firm-walled, at times porose, outer cells not or obscurely running up the margins further than the interior cells, alar cells not differentiated. Dioicous, occasionally autoicous; perichaetia and perigonia terminal; perichaetial leaves not strongly differentiated. Setae elongate, smooth. Capsules cylindrical or subglobose; stomata present in neck; opercula erect-rostrate; annuli well-developed; peristome of 16, short, erect, straight to weakly twisted, spiculose teeth or absent. Calyptrae cucullate.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Trichostomum tenuirostre (Hook. & Tayl.) Lindb., Öfvers. Förh. Kongl. Svenska Vetensk.-Akad. 21: 225. 1864. *Weisia tenuirostris* Hook. & Tayl., Muscol. Brit. (ed. 2): 83. 1827. *Oxystegus tenuirostris* (Hook. & Tayl.) A. Smith, J. Bryol. 9: 393. 1977.

> *Weisia cylindrica* Bruch *ex* Brid., Bryol. Univ. Vol. 1 (suppl.): 806. 1827. *Trichostomum cylindricum* (Bruch *ex* Brid.) C. Müll., Syn. Musc. Frond. 1: 586. 1849. *Oxystegus cylindricus* (Brid. *ex* Brid.) Hilp., Bot. Centralbl. 50(2): 620. 1933.

Plants small to medium-sized, green, dark-green, or yellow-green above, yellow to brown, often shiny at base, in tufts, 5–15 (–30) mm high. Stems red, erect, hyaloderm present, central strand weakly developed; sparsely and irregularly branched; rhizoids weakly developed below, reddish-brown, lightly roughened. Leaves 3–5 mm long, lanceolate, erect and appressed to stem at base, incurved-contorted, curled above when dry, erect-spreading to flexuose when wet; acute, mucronate; lamina unistratose, at times fragile and broken or eroded above; margins entire, plane or erect, often undulate; costa shortly excurrent, guide cells well-developed, ventral and dorsal stereid bands equally well-developed, ventral surface layer enlarged, papillose; upper cells rounded-quadrate, oblate, to short-rectangular, 7–12 µm long, firm-walled, pluripapillose, basal cells long-rectangular to oblong, thin-walled, hyaline, smooth, shorter and thicker-walled in upper part of base, 20–40 µm x 12 µm, outer basal cells somewhat running up the margins in a weak v-shaped pattern. Dioicous. Setae 10–15 mm long; capsules 1.5–3.0 mm long, cylindrical; opercula obliquely long-conic to rostrate; annuli of 1–2 rows of vesiculose cells; peristome teeth erect, 160–240 µm high, weakly to strongly papillose, or striolate. Spores 13–20 µm, finely papillose. Calyptrae cucullate, smooth, naked. n = 13 (Fritsch 1991).

On humus over rocks in woods. In Maine known from Hancock (*Allen 2105* MO), Lincoln (*Allen 22430* MO), Oxford (*Allen 16768* MO), Piscataquis (*Hermann 19581* US), and Somerset (*Allen 9322* MO) Counties. The species was reported from York County (Allen 1993, 1999), but the collection on which the report is based (*Allen 13055A* MO) is *Tortella humilis*.

Trichostomum tenuirostre is a morphologically variable species with lanceolate leaves that are shiny, erect to appressed at base but incurved-contorted and curled

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Figure 1. *Trichostomum tenuirostre*. a. Habit. b. Leaf margin and cells at top of leaf sheath. c. Leaf apex. d. Basal leaf cells. e. & h. Leaves. f. & g. Upper leaf margins and cells. Scale bar in mm: bar = 0.05 (b–d, f & g); bar = 0.3 (e & h); bar = 2.83 (a). Figure a from *Allen 16768* (MO), all other figures from *Parlin 13657* (MO).

above when dry. Its leaf margins are plane to erect and often undulate, and it basal leaf cells which are smooth, enlarged, and hyaline, often run up the margins in a faint v-shaped pattern. Its costa is excurrent into an acute mucro. In North America *T. tenuirostre* has a weak stem central strand, while in other parts of its range it lacks a stem central strand (Saito1975, Magill 1981, Noguchi 1988, Eddy 1990). In Maine *Trichostomum tenuirostre* could be confused with *Tortella humilis* or *T. tortuosa* since all three species have the same field aspect. The *Tortella* species, however, can be distinguished under the microscope by their exceptionably well-developed v-shaped border of hyaline cells that run up the basal leaf margins.

Weissia Hedw., Sp. Musc. Frond. 168. 1801.

Plants small to medium-sized, yellow-green (sometimes green) above, brown to reddish below, in dense or loose tufts. Stems red, hyaloderm and central strand present; sparsely and irregularly branched; rhizoids moderately developed at base. Leaves long-ligulate, oblong-lanceolate, lanceolate, or linear-lanceolate, erect at base, incurved-twisted and contorted, tubulose above when dry, erect-spreading to spreading when wet; acute to acuminate; lamina unistratose, sometimes fragile and broken above; margins entire, plane at base, involute from leaf shoulders to apex; costa excurrent, mucronate, guide cells and two stereid bands present, ventral surface cells enlarged, papillose; upper cells sub-quadrate to hexagonal, firm-walled, pluripapillose, basal cells hyaline, smooth, enlarged, rectangular, thin- or firm-walled, bulging, or long rectangular to linear, at times porose, outer cells sometimes running up the margins farther than the interior cells, alar cells not differentiated. Monoicous, occasionally dioicous. Perichaetia terminal, perigonia lateral; perichaetial leaves not strongly differentiated. Setae elongate, smooth. Capsules ovate to cylindrical; stomata present in neck; opercula oblique-rostrate; annuli well-developed; peristome of 16, short, erect teeth, rudimentary, or absent, basal membrane present or absent. Calyptrae cucullate.

Weissia (90 species world-wide, Crosby *et al.* 2000) is a genus of fairly small, usually yellowish-green plants with stems having a central strand and a hyaloderm. Its leaves are somewhat sheathing at base, with the upper and basal cells strongly differentiated, mid to upper leaf margins tightly involute, and a stoutly mucronate costa. The peristome in *Weissia* is typically reduced; in its best development there are 16 linear teeth, deeply cleft to a basal membrane, but more commonly the teeth are shorter and the basal membrane is rudimentary or absent. Most species of *Weissia* have densely pluripapillose leaf cells, however, there are some Neotropical species with leaf cells that are smooth dorsally and bulging mammillose ventrally. The basal leaf cells in *Weissia* are smooth and strongly differentiated from the upper cells with some species having the outer basal cells running up the margins in a v-shaped pattern.

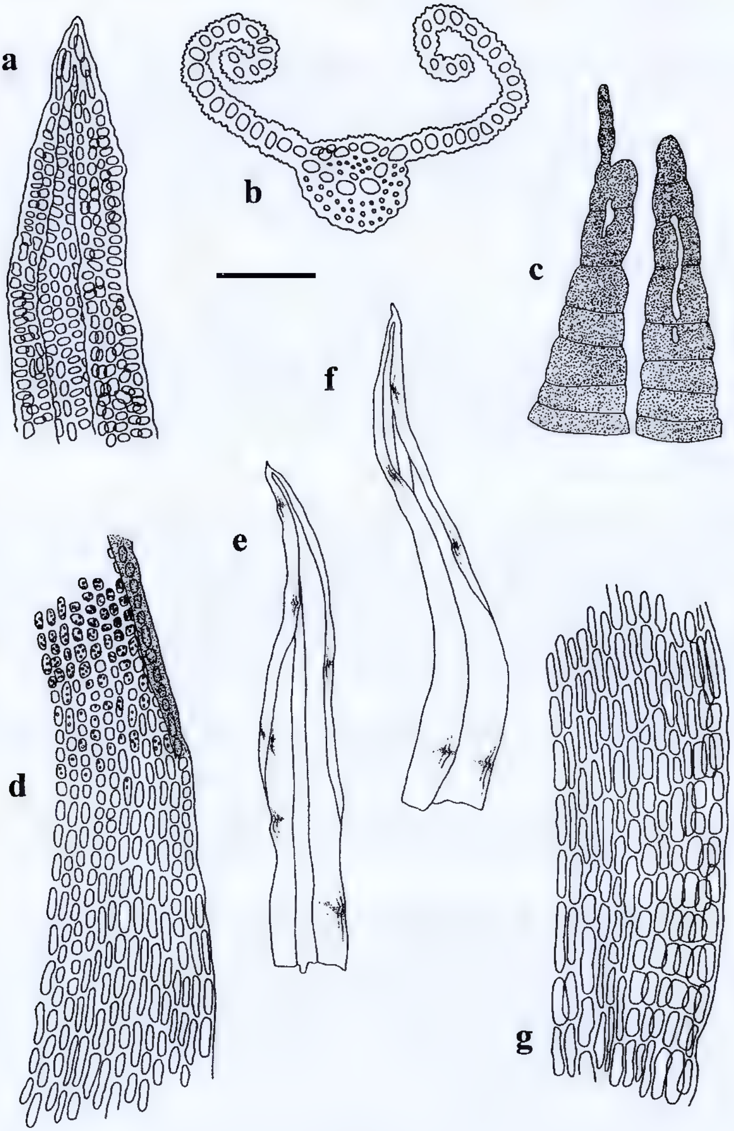
The systematic positioning of *Weissia* is controversial. The genus is often placed in the subfamily Trichostomoideae near *Trichostomum* (Grout 1938, Andrews 1945, Saito 1975, Magill 1981, Zander 1994). Both genera have a stem hyaloderm, stem central strand, and two well-developed stereid bands in their costae. In *Weissia* the peristome is often more reduced than that of *Trichostomum*, and all of its species have strongly involute leaf margins while those of *Trichostomum* are usually plane. However, there are *Weissia* species with fairly well-developed peristomes similar to those found in *Trichostomum* (e.g., *W. jamacensis* and *T. crispulum)* and there are some *Trichostomum* species with strongly incurved upper leaf margins (e.g., *T. crispulum*). Both genera are similar to *Tortella* in having some species in which the outer basal leaf cells run up the margins in a v-shaped pattern. Spagnuolo *et al.* (1999), using ribosomal DNA analysis, provided further evidence for a close relationship between these three genera.

Zander (1993) offered an opposing view of the relationships of *Weissia*. In his view the presence in some species of *Weissia* of upper leaf cells that are dorsally smooth but bulging-mammillose ventrally indicate a relationship to the subfamily Pottioideae, tribe Hyophileae. Some members of this tribe also have a stem a hyaloderm and a central strand, as well as two well-developed stereid bands in their costae and a similar range of peristome form as seen in *Weissia.*

The genus *Weissia* was named by Hedwig for the German botanist Friedrich Wilhelm G. Weiss (1744–1826).

Weissia controversa Hedw., Sp. Musc. Frond. 67. 1801.
Weissia viridula Hedw. *ex* Brid., Musc. Recent. Suppl. 4: 38. 1819.

Plants small-sized, dark-green to yellow-green above, brown below, in dense mats or tufts, 2.5–5 mm high. Stems red, erect, hyaloderm weakly developed, central strand well-developed; sparsely and irregularly branched; rhizoids sparse, red, smooth to roughened. Leaves 1.3–2.3 mm long, linear-lanceolate to lanceolate, ovate to oblong and weakly clasping at base, erect at base, crisped and spirally contorted, tubulose above when dry, erect-flexuose to erect-spreading when wet; acuminate, mucronate; lamina unistratose, firm not fragile; margins entire, strongly involute above from the base to the apex; costa stoutly excurrent, broad at base (40–80 µm), cells on ventral surface quadrate, guide cells and two stereid bands well-developed, ventral surface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layer enlarged, papillose; upper cells rounded to quadrate, 6–11 µm long, thick-walled, bulging at the surface, with 4–6 bifid papillae, basal cells narrowly rectangular, thick- or thin-walled, yellow or hyaline, smooth, 20–50 m x 6–10 µm, outer basal cells hyaline, thin-walled, not noticeably running up the margins in a v-shaped pattern. Autoicous; perichaetial leaves somewhat larger and longer than vegetative leaves, otherwise not strongly differentiated. Setae smooth, 4–8 mm long, yellow; capsules ovoid to oblong, erect, 0.8–1.2 mm long, lightly furrowed when dry, stomata present in neck, opercula rostrate, 0.7–1.0 mm long; annuli with several rows of cells persistent cells; peristome of 16, short, narrowly, erect, red, papillose teeth, basal membrane absent. Spores 18–22 µm, papillose. Calyptrae yellow, cucullate, smooth, to 1.2 mm long. n = 13 or 14 (Fritsch 1991).

On soil, often in disturbed places. In Maine known from Cumberland (*Allen 20484* MO), Hancock (*Dibble 4101* MO), Kennebec (*Merrill 8* MO), and Penobscot (*Norton & Fanning* MAINE) Counties. Reported from Waldo (Parlin 1929) County.

Weissia controversa is an extremely variable species often found on bare soil in disturbed, weedy places. It is a small plant with a distinct yellowish-green color and leaves that are crisped and contorted when dry. There is only one species of *Weissia* in Maine and it can be immediately recognized on the basis of its tightly involute leaf margins. The only other local moss with which it could be confused is *Astomum muhlenbergianum* (Sw.) Grout which gametophytically is nearly identical, but differs from *Weissia* in having deeply immersed, cleistocarpous capsules. Although *A. muhlenbergianum* has not yet been found in Maine, it surely occurs there since the species is found nearby in Massachusetts (Hilferty 1960) and Nova Scotia (Ireland 1982). *Astomum muhlenbergianum* is often found on soil in lawns, among roadside grasses and fallow fields. Other distinctive features of *W. controversa* include: stems with both a hyloderm and central strand; strongly differentiated upper and lower leaf cells in which the upper cells are small, firm-walled, and pluripapillose while the lower leaf cells are enlarged, bulging, and smooth; and a short, stout, smooth, excurrent costa that has two stereid bands.

The peristome teeth of *W. controversa* show no sign of a basal membrane or any other feature usually associated with the Pottiaceae. Instead the teeth, although reduced, appear dicranaceous.

Figure 2. *Weissia controversa*. a. Leaf apex. b. Leaf cross-section. c. Peristome teeth dorsal (outer) surface. d. Leaf margin and cells at top of leaf sheath. e. & f. Leaves. g. Basal leaf cells. Scale bar in mm: bar = 0.03 (c); bar = 0.05 (a,b,d,g); bar = 0.28 (e & f). All figures from Redfearn *et al.*, *Interior Highlands Exsic. 131* (MO).

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Additions to the lichen flora of North America IX. Micarea alabastrites and M. synotheoides.

Tor Tønsberg[1] and Brian Coppins[2]

Abstract. Micarea alabastrites *and* M. synotheoides *are reported new to North America from U.S.A., Washington.*

In corticolous lichen material collected in U.S.A., Washington, by one of us (TT), are specimens of *Micarea alabastrites* and *M. synotheoides*. We believe these species are new to North America as they are not listed in the recent North American checklist (Esslinger & Egan 1995), or as far as we know, in any other paper dealing with North American lichens.

Micarea alabastrites (Nyl.) Coppins - U.S.A. Washington. Cowlitz Co., 8 km SW of Mount St. Helens, E of Goat Mtn, N of Goat Marsh Lake, 46°10'N, 122°17'W, alt. 900-1000 m, Tønsberg 24126 (BG, WTU; conf. Coppins 1997). Pierce Co., along the road between Hwy 410 and Crystal Mountain Ski Resort, along forest trail no. 1163 and Silver Creek, 46°58'N, 121°29'W, alt. 1170 m, 1996, Tønsberg 24048a (BG).

Lignicolous on a stump of conifer (24048a) and on a snag in an old-growth, *Abies procera* forest (24126).

The specimens agree well with European material of the species in having pigment deficient, creamy - to ivory white apothecia, 3-septate spores 16-21 × (3.5-)4.5-5 µm, a micareoid photobiont, and by the production of gyrophoric (major), lecanoric (trace), 5-O-methylhiascic (moderate) acids. Other *Micarea* species found lignicolous at the sites included *M. botryoides* (extensive patches N of Goat Marsh Lake), *M. prasina*, and *M. cinerea*. The material of the last species has pigment deficient apothecia like those of *M. alabastrites*, but the spores, 7-septate and up to 37(-40!) µm, are those of *M. cinerea*.

Micarea alabastrites was previously known from Macaronesia and northwestern Europe. With the specimens cited here, it shows a northwestern Africa and western Europe to northwestern North America disjunct distribution.

Micarea synotheoides (Nyl.) Coppins - U.S.A. Washington. Clallam Co., [Olympic Peninsula,] just E of Crescent Lake NE, alt. 220 m, 48°04.9'N, 123°44.4'W, 2000, Tønsberg 28606 (BG). Thurston Co., WNW of Alder Lake,

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bottom of the north-south running ravine 0.7 km SW of summit of Fossil Rock, alt. 210-230 m, 46°49.4'N, 122°25.9'W, 1998, Tønsberg 25672 (BG, WTU; det. Coppins 2000).

Corticolous on shaded trunk of *Tsuga heterophylla* in old-growth coniferous forest in humid ravine, and on sun-exposed trunk of *Pseudotsuga menziesii* in S-facing slope.

Within the genus, *Micarea synotheoides* is distinguished by the acid deficient thallus with a micareoid photobiont, the ± acicular or rod-shaped, 1-7(-11) septate spores 14-35(-43) × 2-2.5(-3) μm and a greenish, K+ violet hymenium. The species has been confused with *Bacidia beckhausii*, but that species can easily be distinguished by its large-celled (not micareoid) photobiont. In one of the specimens cited above (25627) the greenish pigment occurs in small quantities in the apothecia and the pycnidial wall, but scarcely at all in the thallus—hence the thallus, as well as the apothecia, appears much paler than usual. This specimen apparently represents a pallid morph of *M. synotheoides*. In the other specimen (28606) the greenish pigment is distinct and there is a strong K+ violet reaction in squash preparations of the apothecia.

Micarea synotheoides was previously known from western Europe, Macaronesia and Japan (Coppins 1983, 1992).

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Hepaticae of the Klamath Mountains: I. *Anastrophyllum minutum* in the Siskiyou Mountains of Oregon and California

Steven L. Jessup

Abstract. *Anastrophyllum minutum* (Schreb.) Schust. var. *minutum* (Lophoziaceae) is reported as new to the Siskiyou Mountains of Oregon and California. Two recently discovered populations extend the southern limit of the known range in the Pacific Northwest. This is the first published report of *Anastrophyllum minutum* in California. Diagnostic characters of the species needed for recognition in the field and confirmation in the laboratory are summarized. A series of photomicrographs published on an internet web site (http://www.sou.edu/biology/Courses/Bi507/Anastrophyllum.htm) is referenced to illustrate the salient characters.

Anastrophyllum minutum var. *minutum* has a broadly circumpolar distribution with southern lobes of the range in the Eastern Hemisphere extending into Asia, Africa, and Europe (Frye and Clark, 1945). In the Southern Hemisphere it is reported from disjunct localities on Kerguelen Island, in South Africa, and at high elevations sites in New Guinea and Borneo (reviewed in Schuster, 1974). In eastern North America the species ranges south in the Appalachian Mountains to North Carolina and Tennessee, at high latitudes across the northern continental interior, and south into Michigan, Wisconsin, and Minnesota (Schuster, 1969). In western North America it is known from Alaska north of the Arctic Circle, throughout the western cordillera in Canada, and into the Pacific Northwest, with a disjunct occurrence reported from high elevations in Mexico. Hong (1996) maps the distribution in northwestern North America from known herbarium records and shows three collection sites in northwestern Washington, one site in Idaho, and three sites in northwestern Montana. In that paper Hong reports the species as new to Oregon and maps a single locality in the coastal range of Curry County, on the Elk River. Christy and Wagner (1996) also map the distribution in Washington and Oregon, showing two different sites in Oregon, both in the Cascades of the northern half of the state, in Hood and in Linn counties.

It is evident from the sparse record of collections in Oregon that *Anastrophyllum minutum* is exceedingly rare in the southern corner of its range in western North America. In the southern part of its northwest distribution the plant occurs on cool wet mineral soils and rocks on shaded cliff faces and ledges, and is generally restricted to higher elevations (Hong, 1996; Christy and Wagner, 1996). Since it has only been found in the Pacific Northwest at higher elevations in remote areas

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it is not presently considered threatened or endangered there, but the Oregon Natural Heritage Program classifies it as a List-3 species, requiring more study before its conservation status can be accurately assessed (ONHP, 2000). Christy and Wagner (1996) suggest that overcollecting by bryologists may present one of the primary threats to persistence of known populations. Collecting a rare plant from a known locality is, of course, an unacceptable practice in almost every case. Unless a field identification can be made, however, the inconspicuous stature of the plant and its propensity for dimly lit habitats could increase the probability that it will be unintentionally collected. Awareness of the characters that enable an accurate field diagnosis could perhaps reduce the likelihood that a population would be inadvertently damaged through overcollecting. This report summarizes the diagnostic features and habitat preferences needed to recognize *Anastrophyllum minutum* in the field at the time of collection.

In 1999 I collected *Anastrophyllum minutum* in the Siskiyou Mountains at two previously unknown localities. The following two collection records document an extension of the known southern limit of the range in North America and a first published record of the species for the state of California.

Oregon: Jackson County, Big Red Mountain, 42° 3' 6" N, 122° 50' 8" W; pure turf of erect plants on steep slope below north-facing ledges of granodiorite outcrop, east end of ridge; elevation 2134 meters.
8 July 1999, *S.L.Jessup 7620* (SOC).

California: Del Norte County, Black Butte, 41° 55' 16" N, 123° 36' 5"W; sparsely intermixed with *Pseudoleskea patens* at base of dripping andesite cliffs, and as a pure turf in seep, deep in crevice below massive overhanging ledge, north face of butte, just above trees; elevation 1707 meters. 14 June 1999, *S. L. Jessup 7408* (SOC).

At the Black Butte site, bryophytes closely associated with *Anastrophyllum minutum* include *Gymnomitrium obtusum*, *Lophozia adscendens*, *Lophozia bicrenata*, *Diplophyllum taxifolium*, *Andreaea blytii*, and *Andreaea rupestris*. The vascular plant flora at the Black Butte site is dominated by a mature stand of *Cupressus nootkatensis*, the Alaska Yellow Cedar, and *Picea breweriana*, Brewer's Spruce, with a dense understory of *Quercus saddleriana*, Saddler's Oak. The vegetation at the Red Mountain site is dominated by *Tsuga mertensiana*, the Mountain Hemlock.

Though small and often inconspicuously situated where it grows, *Anastrophyllum minutum* can be recognized by a suite of morphological features accessible with a hand lens in the field. Confirming the identification with diagnostic details of leaf cell size, cell wall thickness, and oil body morphology requires a compound microscope. All figures referenced here are photomicrographs on the internet web site, http://www.sou.edu/biology/Courses/Bi507/Anastrophyllum.htm. The diagnostic combination of traits can be summarized in six steps:

1) small erect or ascending stems, 0.7 to 1.5mm wide (Figure 1), in dense turfs or sparsely intermixed with other bryophytes (Figure 2),
2) growing on damp soil or rock in cool deeply shaded high elevation sites, typically on north slopes or dripping faces of cliffs,
3) subtransverse-succubous insertion of equally-lobed lateral leaves, having acute sinuses and subtly acuminate lobe tips (Figure 3),
4) complete absence of underleaves, and with a marked dorso-ventral asymmetry (Figure 1),
5) gemmiferous stems bearing dense terminal clusters of dark red to scarlet angular few-celled gemmae (Figure 2 and Figures 8-10),
6) evenly thick-walled subquadrate median leaf cells, generally 15-24μ (Figures 4-5), typically containing two to five finely papillose oil bodies (Figures 6-7).

A search for *Anastrophyllum minutum* requires considerable logistical planning and exertion to attain the base of remote north-facing mountain cliffs where late snowmelt and perennial seepage occur. Searching a likely site for this species involves particular attention to dark recesses and crevices, narrow dimly lit crags, and the undersides of large overhangs. Reaching deep into fissures in the rock beyond the lighted opening may reveal to the touch a fine damp pad of tightly packed plants. Care should be taken at this point to pinch just enough of the turf to make a preliminary determination. Surprisingly little material is needed to confirm the species, and even a thumbnail sized pinch will serve as an adequate voucher. The Black Butte collection cited above is about 3 square centimeters in its entirety. The Red Mountain collection is about twice that size.

Certainly other localities remain to be found farther west in the Siskiyou Mountains and farther south in other ranges of the Klamath Mountains of California. Likely areas include Preston Peak and the Devil's Punchbowl, the Marble Mountains, the Salmon Mountains, the China Mountains, the Trinity Alps, and the Yolla Bolly Mountains. The persistence of an *Anastrophyllum minutum* population at any given site may hinge on the integrity of a few delicate patches of the plant occupying the narrow confines of the limited niche available at that locality. While continued research into the biogeographic distributions of bryophytes is a valuable contribution to our science, awareness of the fragility of the populations we visit and a sensitive knowledge of the plants we collect when we collect them are the best protections against the threat of extirpation through overcollecting.

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